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ABSTRACT

This report presents the results of the 1974 survey of industrial research and development and is the twentieth in a series extending back to 1953. Data on R&D expenditures and R&D scientists and engineers presented in this report were collected by the Bureau of the Census for the National Science Foundation, and cover the periods of 1956-74 and January 1957-January 1975, respectively. The information is organized under eight categories: R&D funds; employment of R&D scientists and engineers; distribution of R&D funds; energy and pollution abatement research and development; basic research, applied research, and development; geographic distribution of R&D funds; R&D funds related to net sales and employment; and federally funded research and development centers. Appendices present industrial R&D data on two different bases: first, total R&D data are furnished on the traditional industry basis for the years 1953-1974, and second, the applied research and development data are presented on a product-field basis. (DT)

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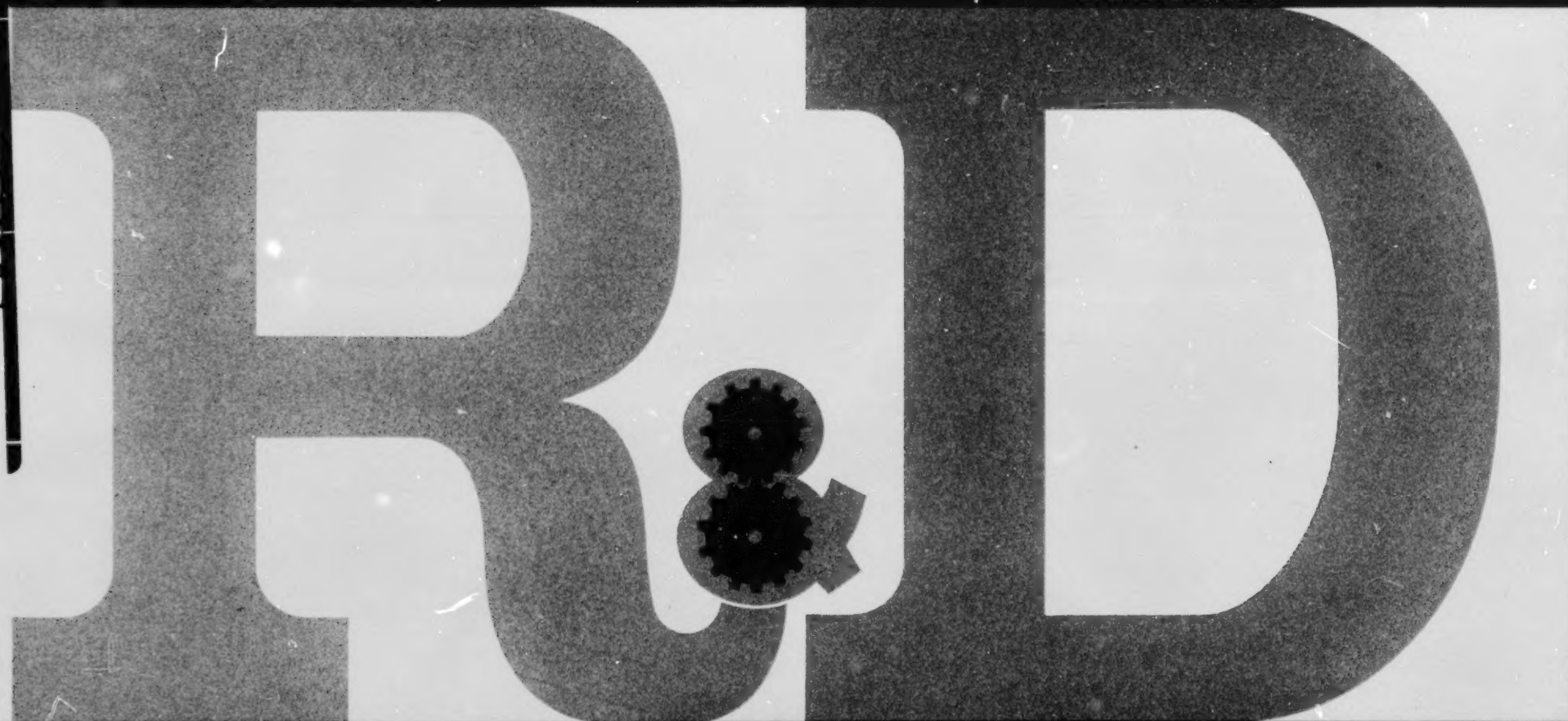
RESEARCH AND DEVELOPMENT IN INDUSTRY 1974



FUNDS, 1974
SCIENTISTS & ENGINEERS
JANUARY 1975

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FOREWORD

The National Science Foundation maintains a continuing effort designed to measure and assess the scientific and technological welfare of the Nation. This program is carried on through a series of regularly scheduled, as well as periodic, statistical surveys and is supplemented by special studies as needed.

In 1974, the year covered by this report, the Nation was in the midst of a severe recession. Inflation was at an all-time high. Corporate profits declined for the manufacturing sector from the year before and this decline was reflected in the profit data for each of the five industries that account for four-fifths of the R&D expenditures throughout the industrial sector. During this time, industry, which traditionally accounts for over two-thirds of the Nation's R&D expenditures, increased its own spending for R&D programs by 11 percent over 1973. The data presented in this report describe the nature and characteristics of these R&D programs of industry, in terms of resources utilized, and provide a basis for analysis of the industrial R&D enterprise over the past two decades. Statistical measures contained herein pertain to the level of human and financial resources allocated for the performance of industrial research and development, including data on the type of R&D activity being conducted, sources of funding, geographic distribution, employment of scientists and engineers, and other related indicators.

This report was prepared in the Division of Science Resources Studies, Charles E. Falk, Director, under the general supervision of William L. Stewart, Head, R&D Economic Studies Section. Data contained in the survey were collected and compiled by the Bureau of the Census, U.S. Department of Commerce, under the general direction of Milton Eisen, Chief, Industry Division.

The National Science Foundation and the Bureau of the Census gratefully acknowledge the cooperation of the numerous organizations that provided data for this study.

Richard C. Atkinson
Acting Director
National Science Foundation

September 1976

acknowledgments

Within the National Science Foundation, this report was prepared by Jolin R. Chirichiello, Paul M. White, and Robert O. Santos, under the supervision of Thomas J. Hogan, Study Director, Industry Studies Group. Lola E. Seidl assisted in the preparation of the statistical material.

Within the Bureau of the Census, U.S. Department of Commerce, the 1974 survey of industrial research and development was supervised by James S. Werking, Assistant Division Chief for Current Programs, Industry Division, assisted by Wayne M. McCaughey, Paul Beasley, Mike Evans, and Linda Schlueter. Donald F. Clark, Assistant Chief, Statistical Research and Methodology, served as statistical consultant for the project.

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SUMMARY

- Industrial R&D expenditures totaled \$22.4 billion in 1974, 7 percent higher than in 1973. In constant dollars, however, expenditures declined by 3 percent between the 2 years. The industry sector traditionally performs most of the country's research and development; in 1974 industry's amount was nearly 70 percent of the total.
- Company R&D funds increased by 11 percent between 1973 and 1974 to a level of \$14.0 billion. A reduction of \$190 million in DOD R&D funding—barely offset by gains in other Federal R&D programs—held the overall level of 1974 Federal R&D funds in industry to a 1-percent increase. Thus, in 1974, 63 percent of industry's R&D effort was financed with its own funds.
- The full-time-equivalent (FTE) number of R&D scientists and engineers employed in industry declined by less than 1 percent between January 1974 and January 1975 to 357,500. This was well below the peak reached in January 1969 when R&D professional employment in industry totaled about 387,000.
- Energy R&D spending by industry amounted to \$1.2 billion in 1974, or 19 percent above the total expended on these activities during 1973. Industry spent \$646 million in 1974 for pollution abatement research and development.
- DOD and NASA, providing 86 percent of the Federal R&D funds to industry in 1974—supported 86 percent of the industrial R&D scientists and engineers working on Federal projects; both percents were essentially the same as a year earlier.
- The industrial basic research total rose to \$683 million in 1974, up 10 percent over 1973. Almost one-half of this amount was spent on the physical sciences, primarily by firms in the chemicals industry. Applied research and development spending amounted to \$21.7 billion in 1974, 7 percent over the 1973 amount.
- In 1974 R&D-performing manufacturing companies spent an average of 2.9 percent of their net sales on R&D activities, down from 3.3 percent in 1973, continuing the long-term decline from the 1964 high of 4.6 percent. The sharp decline between 1973 and 1974 was attributable to a combination of a 20-percent spurt in net sales, over one-half of which was reported by firms in the chemicals and petroleum industries, plus a minor growth of Federal R&D support to industry.
- Industry-administered Federally Funded Research and Development Centers funds rose 19 percent between 1973 and 1974. This increase accounted for essentially all of the rise in total Federal R&D funds to industry over this period.
- In 1974 the average R&D cost per scientist and engineer was \$62,500. Over the period 1964-76, this cost has risen at an average annual rate of nearly 5 percent. Reflecting the nature of the activities involved, this cost differs sharply by industry. The 1974 figure ranged from \$29,700 in the instruments industry to \$89,200 in the motor vehicles industry.

INTRODUCTION

Research and development in the United States continues to be a significant factor in influencing economic growth, particularly in the areas of job creation and improved productivity. In 1974 \$32.3 billion was devoted to this activity. The industrial sector has traditionally been the major performer of research and development in the United States, usually accounting for about two-thirds of the total effort. The year 1974 was no exception, as companies undertook nearly 70 percent of the national total. This reflects industry's attempt to continue ongoing efforts to introduce regularly new and improved products into the marketplace. It also reflects the substantial resources being placed against producing these products in a more efficient and/or less costly manner. Increasing sums are also being spent by industry to improve product safety, to reduce environmental pollution, and to understand better and to minimize any detrimental side effects associated with technological advances.

In addition to being the major R&D performer in the United States, industrial firms are providing an increasing share of the funds supporting this vast technological effort. In 1974 industry supplied 44 percent of the U.S. total, up from 31 percent only a decade earlier. This is attributable not only to a reallocation of Federal monies as costly space and defense R&D projects have been completed, but also points to the continuing interest that industry has in maintaining a viable R&D program.

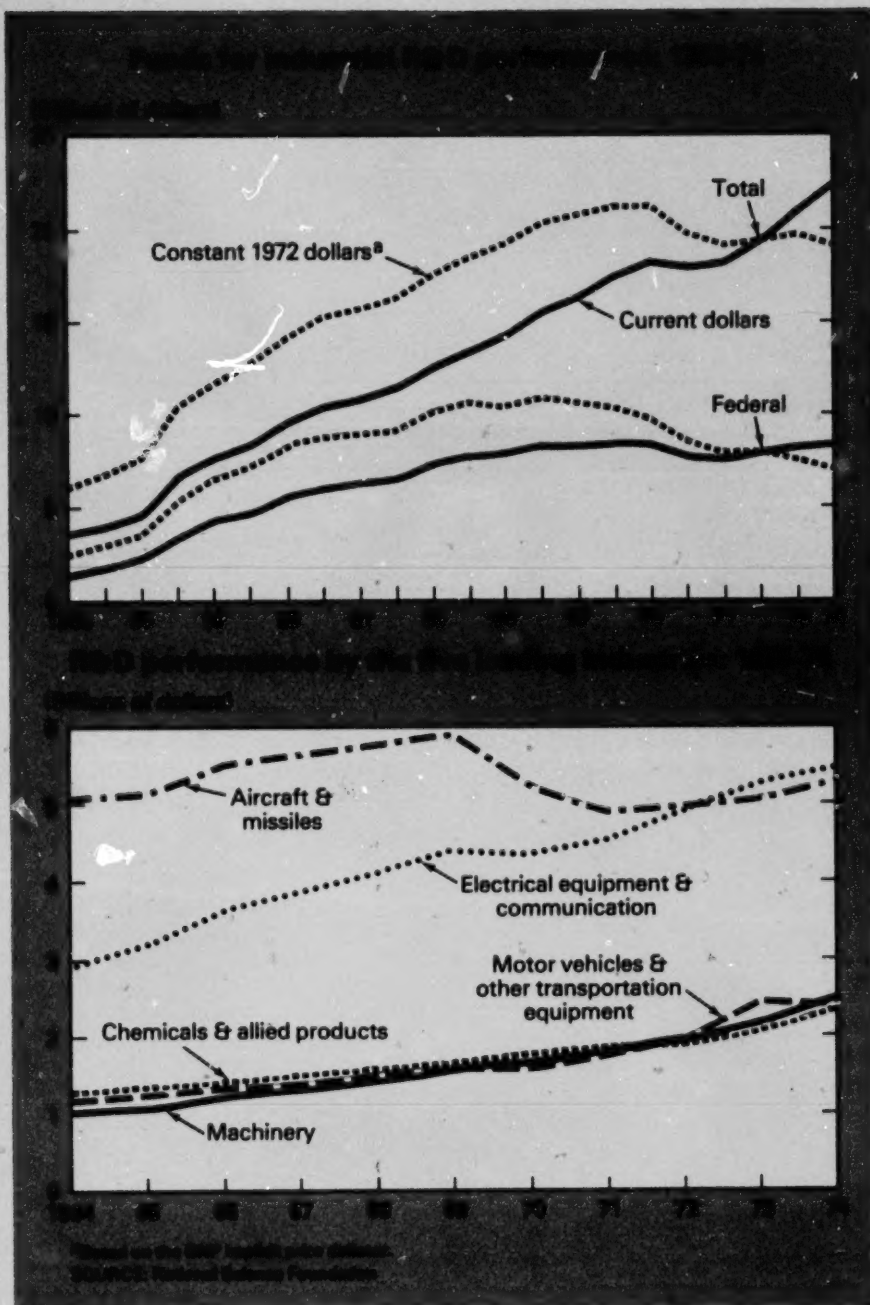
For 1975, it is anticipated that Federal support to industry will grow at a somewhat accelerated pace—compared to the early seventies—primarily in nondefense and nonspace activities. Company R&D funds are also expected to grow, but at a lower rate than that of the past 2 years. Since corporate decisions regarding future R&D spending are often tied to current profit estimates, the decline in profits of manufacturing firms between 1973 and 1974 suggests a slowdown in company R&D spending in 1975.

Data on R&D expenditures and R&D scientists and engineers presented in this report were collected by the Bureau of the Census for the National Science Foundation and cover the periods 1956-74 and January 1957-January 1975, respectively. The report is the 20th in a series originating in 1953.

This report presents industrial R&D data on two different bases. First, total R&D data are furnished on the traditional industry basis for the years 1953 to 1974 (appendix tables B-1 to B-50). The second approach presents the applied research and development data on a product-field basis (appendix tables B-51 to B-56). Because of its generalized nature, basic research cannot readily be classified by product field; instead, these data are classified by field of science.

This report does not cover trade associations, which are estimated to account for less than 1 percent of the industrial R&D performance total. Although trade associations are nonprofit organizations, their primary mission is to serve industry.

GENERAL CHARACTERISTICS



R&D Funds

Funds for industrial research and development reached \$22.4 billion in 1974, increasing by 7 percent from the 1973 level of \$20.9 billion. In constant dollars, however, these funds declined by 3 percent. The amount of industrial R&D performance in 1974 was not significantly greater than the amount in 1964, if measured in terms of constant dollars;¹ the average annual rate of growth over that span was less than 1 percent.

Preliminary 1975 R&D estimates show an increase of 4 percent over 1974 levels. This relatively small increase can be attributed to companies in the electrical equipment and motor vehicles industries, where R&D funds are expected to remain level, and decrease 3 percent, respectively.

LEADING INDUSTRIES

In 1974 the five leading R&D-performing industries—electrical equipment and communication, aircraft and missiles, machinery, motor vehicles and other transportation equipment, and chemicals—spent over 80 percent of total industrial R&D funds. Companies in the first two industries accounted for nearly one-half of the industrial total.

Between 1973 and 1974 the largest percentage increases in total R&D spending were recorded by the chemicals and machinery industries, both up about 14 percent. After a 23-percent increase between the previous 2 years, total R&D expenditures by the motor vehicles industry remained virtually level in 1974. This resulted largely from sharp reductions in the industry's sales and profit levels. The aircraft and missiles industry experienced its largest annual increase in R&D spending—4 percent—since the mid-sixties. The electrical equipment industry also showed a 4-percent gain. The increases shown for the two latter industries were influenced significantly by sharp gains in company's own funds.

All of these industries, except aircraft and missiles, steadily increased their R&D spending over the past decade. The aircraft and missiles industry also showed R&D increases between 1965 and 1969, but thereafter showed a decline because of decreased emphasis on defense and space programs.

¹ In the absence of a reliable R&D cost index, the GNP (gross national product) implicit price deflator was used to convert R&D spending to constant dollars. The GNP deflator includes the effects of the price change for all goods and services in the economy and therefore can only indicate approximate changes in costs of inputs specifically related to R&D performance.

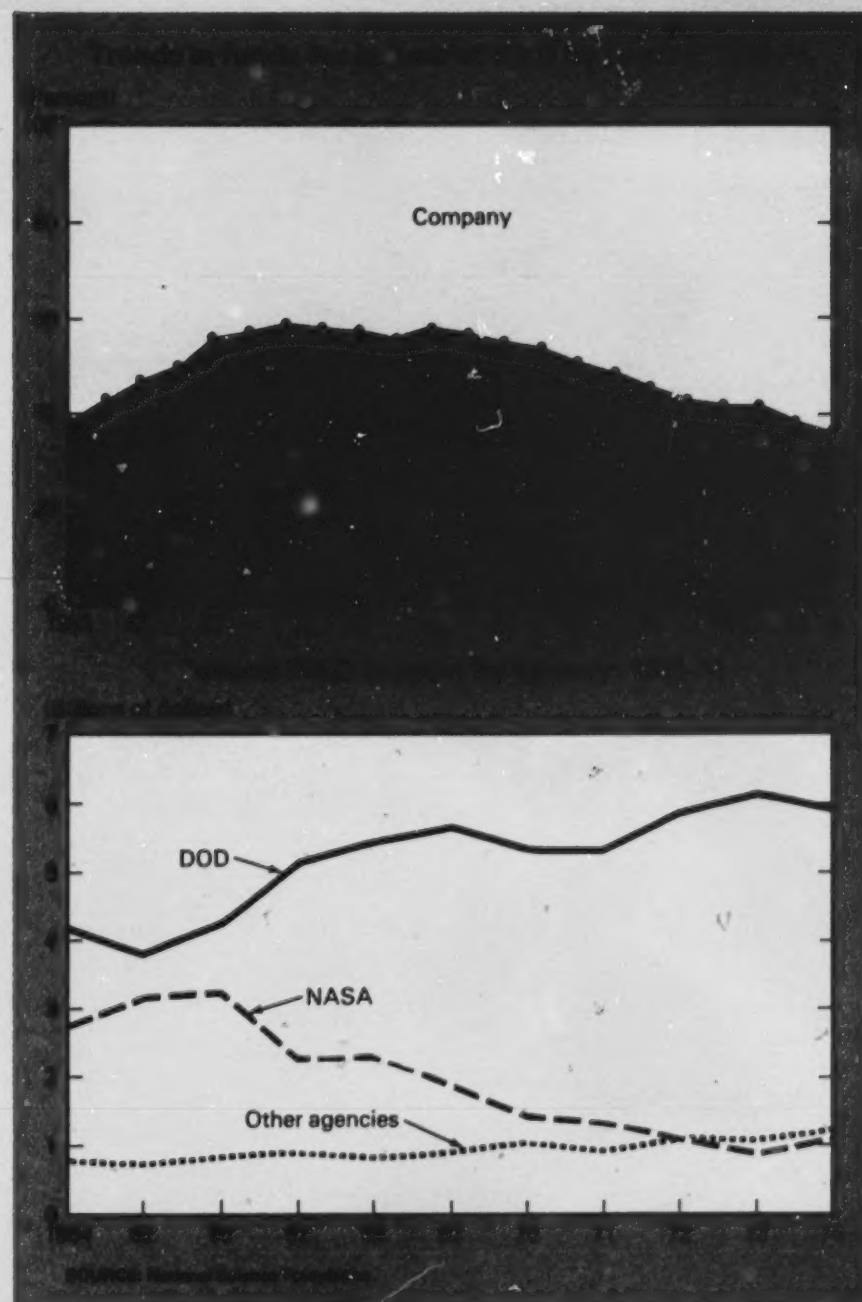
FEDERAL SHARE

The Federal Government provided \$8.3 billion to industry in R&D contracts or subcontracts in 1974. Federal financing of industrial research and development increased by 1 percent over the 1973 level, but declined as a proportion of total industrial R&D funding, from 39 percent in 1973 and 37 percent in 1974. The Federal share has fallen steadily since its peak of 58 percent in 1963. A 19-percent increase in spending by industry-administered Federally Funded Research and Development Centers (FFRDC's) was primarily responsible for the 1974 increase in Federal funds to industry.

Historically, Federal funds have been directed to a small number of industries. In 1974, as in recent years, over 90 percent of Federal R&D support went to five industries. Companies in two industries—electrical equipment and communication and aircraft and missiles—received over 80 percent of Federal R&D funds.

The Department of Defense (DOD) provided just less than \$6 billion to industry for R&D projects in 1974, accounting for over 70 percent of the Federal total. This represented a 4-percent decline from a year earlier, and resulted largely from a reduction in support of 4 percent in the electrical equipment and communication industry and 8 percent in the motor vehicles industry. A large part of this decline reflected a cutback in support of the aerospace and communications-related research and development in these industries. The National Aeronautics and Space Administration (NASA) provided \$1.1 billion, 11 percent more than in 1973; this was the first major increase in NASA's R&D support to industry since 1966 when it provided \$3.2 million. A major factor in the sharp NASA increase was the development cost associated with the space shuttle.

The aircraft and missiles industry received \$4.1 billion in Federal R&D support in 1974, three-fourths from DOD and 19 percent from NASA. The electrical equipment and communications industry received \$2.6 billion, 71 percent from DOD.



COMPANY-FINANCED RESEARCH AND DEVELOPMENT

Company-financed research and development amounted to \$14.0 billion in 1974, nearly 11 percent above the 1973 level in contrast to the 1-percent increase in Federal financing of industrial research and development noted earlier.

Since the midsixties, companies' own R&D funds have increased at a much faster rate than Federal R&D support to industry. The indexes below show that, since 1967, total Federal funds, in current dollars, have remained essentially level, while total company funds have increased by 75 percent. The trend does not differ markedly for any of the five leading R&D-performing industries. The machinery and motor vehicles industries experienced the most rapid growth in company funds, averaging over 11 percent annually, followed by the electrical equipment and chemicals industries, averaging 9 percent and 7 percent, respectively. Federal funds to these industries showed only slight rates of growth or decline.

Indexes of five industries leading in R&D performance
by source: selected years

Industry, by source of funds [Current dollars]	1967	1970	1971	1972	1973	1974
Total Federal	100	93	92	96	98	100
Aircraft and missiles	100	89	86	89	88	91
Electrical equipment	100	98	100	109	114	112
Chemicals	100	86	88	90	98	103
Machinery	100	74	90	107	104	111
Motor vehicles	100	86	84	84	112	86
Total company	100	128	133	141	158	175
Aircraft and missiles	100	107	89	83	96	103
Electrical equipment	100	133	142	154	170	185
Chemicals	100	122	126	131	143	166
Machinery	100	140	148	161	185	213
Motor vehicles	100	128	146	169	205	212

In 1974 companies in the electrical equipment industry spent \$2.9 billion of their own funds and \$2.6 billion of Federal funds for R&D activities. The chemicals, machinery, and motor vehicles industries each spent \$2.1 billion of company funds on R&D projects in 1974, and in each industry this represented between 85 percent and 90 percent of its total R&D funding. The aircraft and missiles industry, however, spent \$1.2 billion of company funds but received \$4.1 billion in Federal R&D funds.

In 1974 industrial firms reported that \$284 million in company-financed R&D projects were contracted to outside organizations—universities and colleges, nonprofit institutions, and other companies. Three industries, chemicals, motor vehicles, and petroleum, accounted for over one-half of this amount.

Employment of R&D Scientists and Engineers

Between January 1974 and January 1975 the full-time-equivalent (FTE) number of R&D scientists and engineers employed in industry decreased by less than 1 percent from 358,200 to 357,500. This manpower total remained relatively stable from 1973 to 1975, but at a level well below the 1969 peak of 387,100.

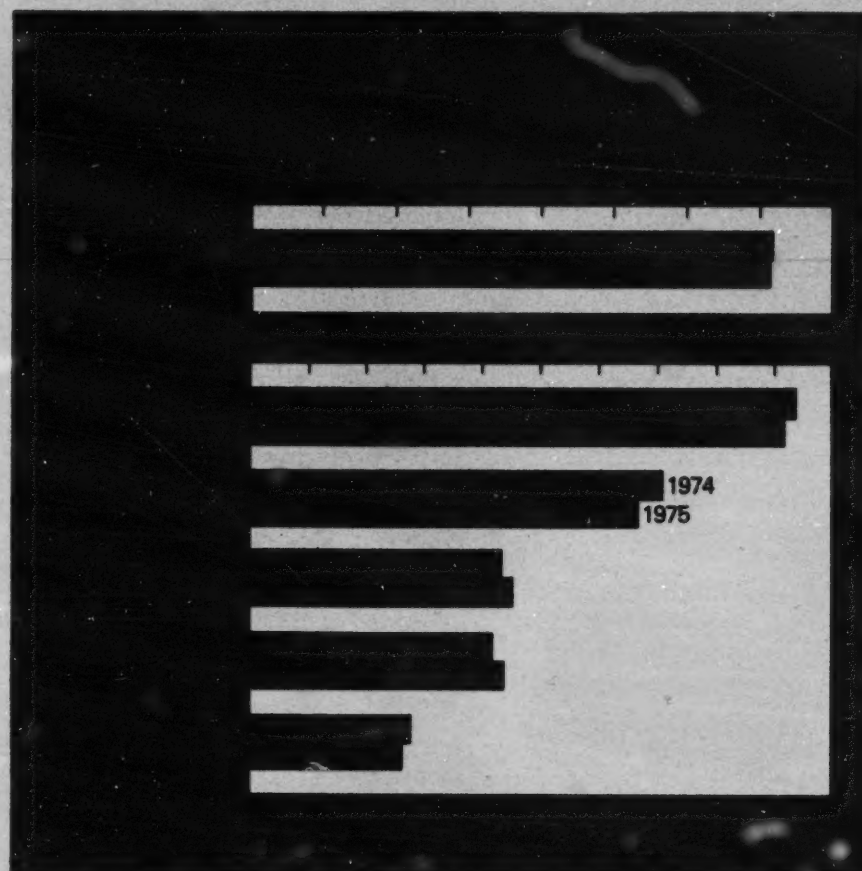
Only three industrial groups registered decreases between January 1974 and January 1975; all three, however, were among the five leading industries. These declines slightly more than offset the increases recorded by all other industries. The aircraft and missiles industry experienced a 6-percent drop in R&D professional employment and showed the largest absolute decline, 4,200. Employment in the motor vehicles industry also fell 6 percent, the third consecutive annual decrease for this industry. The electrical equipment and communication industry, which employs the largest number of R&D scientists and engineers, showed a 2-percent decline. The chemicals and machinery industries each recorded gains of 4 percent.

Nearly two-thirds of industry's R&D scientists and engineers are employed by companies with more than 25,000 total employees. This size class alone showed a decline in R&D scientists and engineers (2 percent). All other size classes registered increases, the largest in the group of companies with less than 1,000 employees—up 5 percent.

SOURCE OF SUPPORT

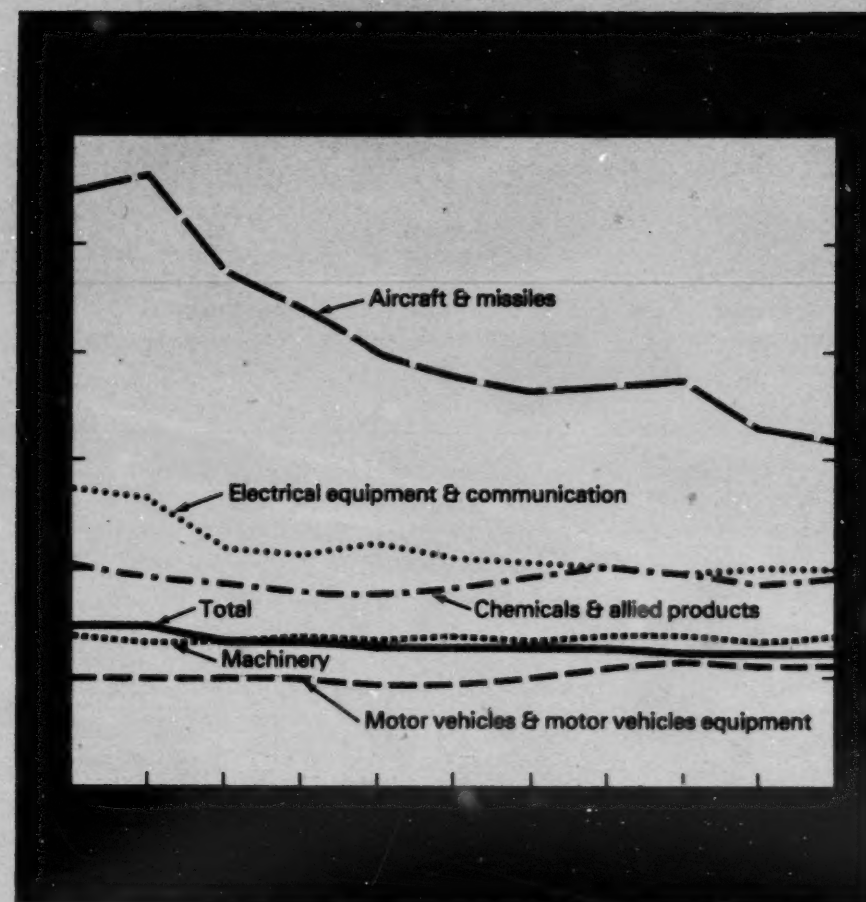
Over two-thirds of the R&D scientists and engineers employed by industry in January 1975 were supported by company funds, and the remainder by Federal funds. The small decrease in manpower from the January 1974 level was shared about equally by company and federally financed R&D projects, and industry-by-industry changes tended to offset each other.

In the five leading industries, most federally financed R&D scientists and engineers were employed in the electrical equipment and aircraft and missiles industries. Changes in Federal manpower support between January 1974 and January 1975 were small, with the exception of a 5-percent reduction in the aircraft and missiles industry.



SCIENTIFIC VERSUS OTHER EMPLOYMENT

For all industries the overall ratio of R&D scientists and engineers per 1,000 employees was 25 in 1972, 1973, and 1974, declining from 26 during the period 1968-71. Examination of this measure for the leading R&D-performing industries, however, reveals considerable variation. This ratio in the aircraft and missiles industry dropped from a high of 113 in 1965 to a low of 64 in 1974. Reduction of Federal R&D support, especially by NASA, was the major factor in lowering R&D intensity in this industry. Of the remaining largest four industries, electrical equipment remained at 40 and motor vehicles at 22, chemicals increased from 38 to 39 and machinery increased from 27 to 28. Office, computing, and accounting machines, a component of the machinery industry, increased from 57 to 60.



Distribution of R&D Funds

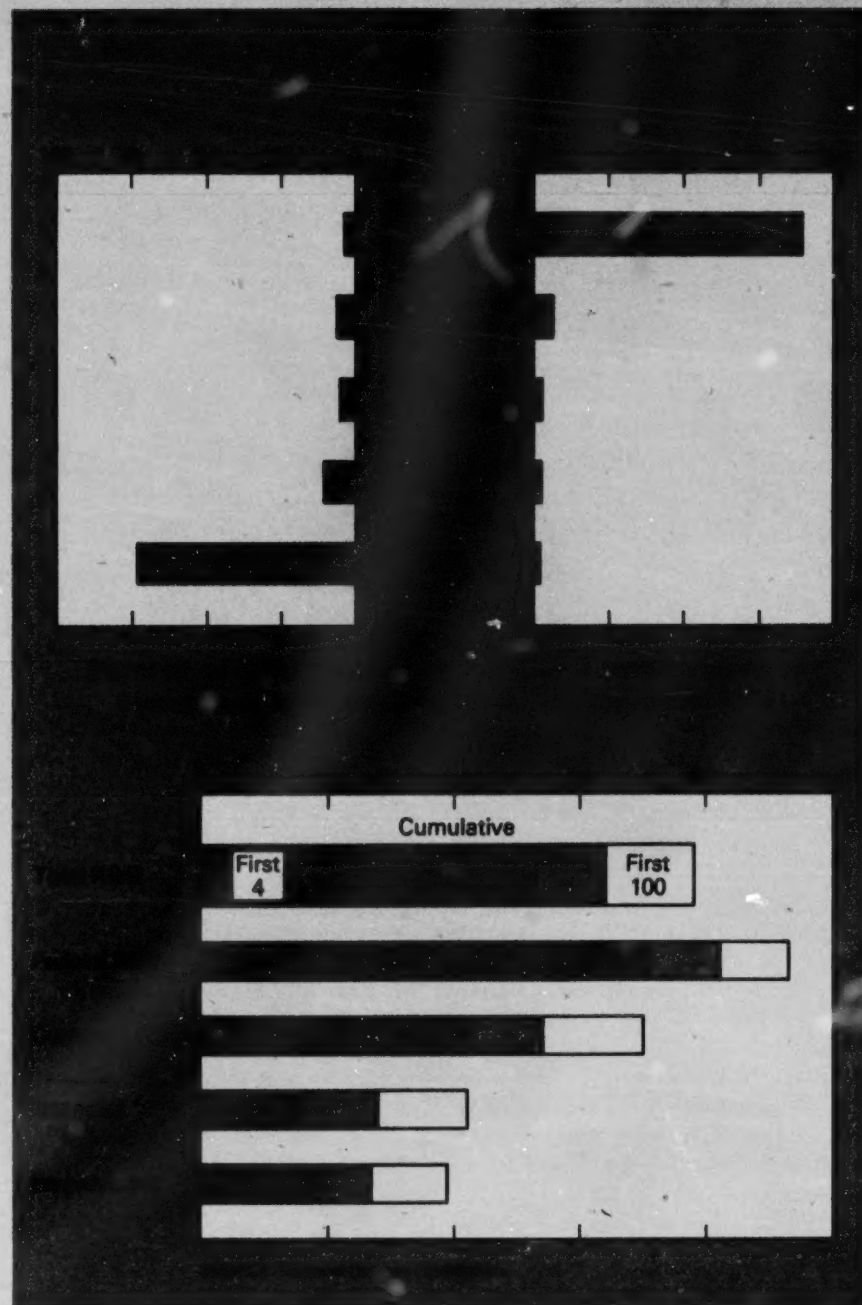
SIZE OF COMPANY AND R&D PROGRAM

The 126 R&D-performing companies with employment greater than 25,000 reported projects totaling \$16 billion, representing almost three-fourths of U.S. industrial research and development in 1974. There were 35 companies with projects in excess of \$100 million. Companies with employment of less than 5,000 numbered over 10,000, or 95 percent of R&D-performing companies, but they accounted for just 10 percent of the industrial performance.

The four companies with the largest R&D programs in 1974 performed 19 percent of all industrial research and development, measured in terms of expenditures. These firms accounted for 18 percent of the Federal R&D money contracted to industry and 20 percent of the company R&D funds.

Over three-fourths of all industrial research and development in 1974 was performed by the 100 companies with the largest R&D programs. These same companies accounted for 93 percent of Federal support and 70 percent of company-financed R&D activity.

The 100 largest R&D-performing companies also were responsible for 42 percent of net sales and 39 percent of employment of all R&D-performing companies during 1974.



SOURCE OF FUNDS BY SIZE OF COMPANY

The distribution of Federal versus company R&D financing varied substantially among company size groups. The largest companies, those with 25,000 or more employees, had the highest percentage of Federal funding—42 percent. The remainder came primarily from company's own funds, plus other non-Federal Government R&D contracts. Companies with less than 1,000 employees, the smallest companies, were second with 36 percent of their research and development federally financed. Company size groups in between these two categories had a significantly lower percentage of Federal support: 1,000 to 4,999 employees, 30 percent; 5,000 to 9,999 employees, 15 percent; and 10,000 to 24,999 employees, 20 percent.

MAJOR TYPE OF COST

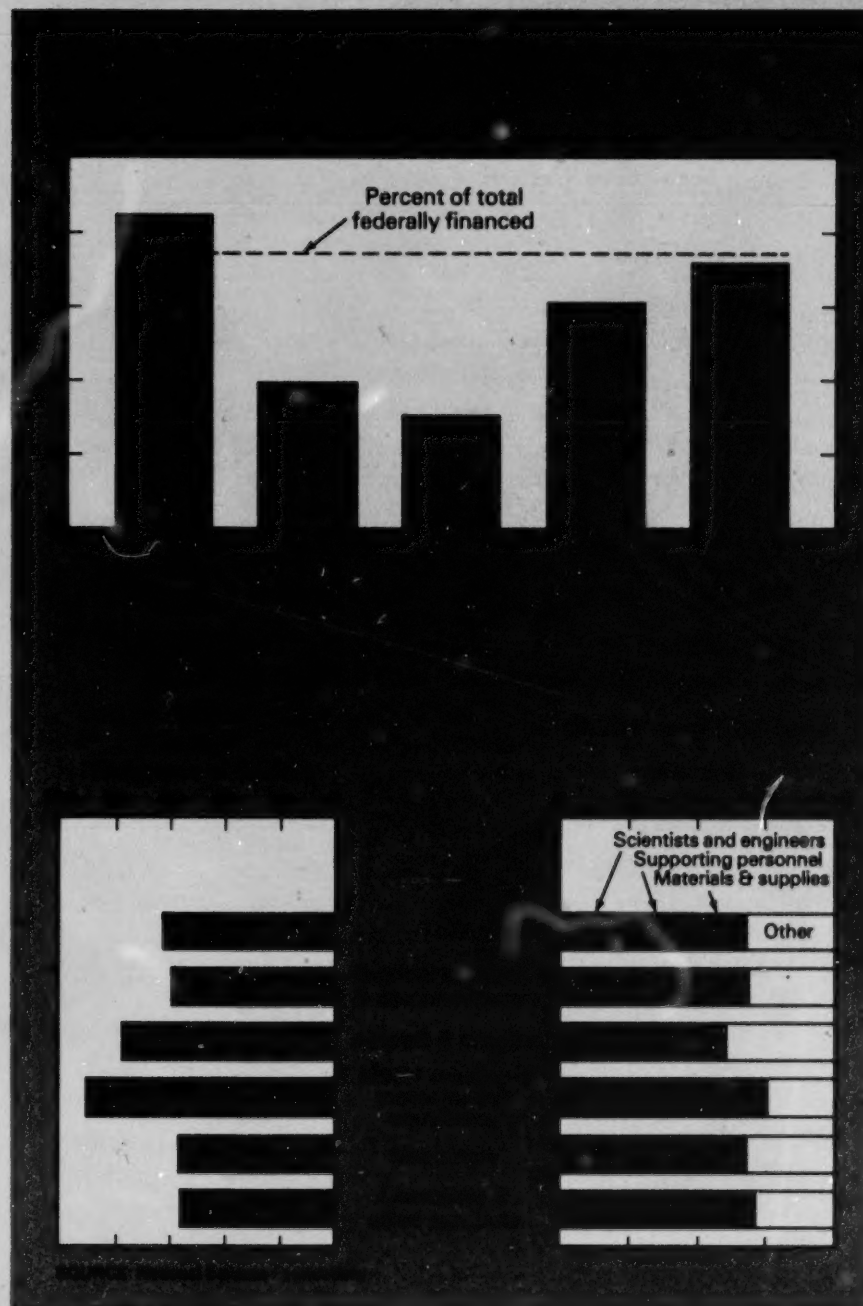
In 1974, for each R&D scientist or engineer employed, industry spent an average of \$62,500 for research and development. Since 1965 this cost has increased at an average annual rate of nearly 5 percent. Development-intensive industries exceeded the average; e.g., motor vehicles, \$89,200 and aircraft and missiles, \$77,200. The chemicals industry, which is more research-intensive, spent less than the average—\$55,600.

Wages and salaries of R&D scientists and engineers and supporting personnel accounted for one-half of all industrial R&D spending in 1974. The remainder was divided between materials and supplies, 18 percent, and other costs, 32 percent. These ratios were derived from the responses of companies accounting for 93 percent of all industrial R&D performance. There has been little change in these ratios in the recent past.

Of the five leading R&D-performing industries, the chemicals industry reported the highest allocation to professional salaries—36 percent. The all-industry average was 31 percent.

The largest share of R&D funds devoted to supporting personnel costs, 31 percent, was reported by the motor vehicles industry; the all-industry average was 19 percent. The motor vehicles industry is development-intensive, and more dependent upon supporting personnel than a research-intensive industry, e.g., drugs and medicines.

The all-industry average share devoted to materials and supplies was 18 percent. The aircraft and missiles and electrical equipment industries allocated 22 percent and 21 percent, respectively, to these costs.



Energy and Pollution Abatement Research and Development

Industry spent \$1.2 billion in 1974 for energy research and development—19 percent more than in 1973. An additional 6-percent increase was expected for 1975.

Four industries accounted for 80 percent of the 1974 total: electrical equipment, \$374 million; petroleum, \$372 million; aircraft and missiles, \$129 million; and chemicals, \$84 million.

Federal funds to industry for energy research and development increased by 24 percent to \$479 million in 1974, accounting for 40 percent of the total. The electrical equipment industry received \$292 million or 61 percent of Federal energy R&D funds, principally for nuclear energy projects.

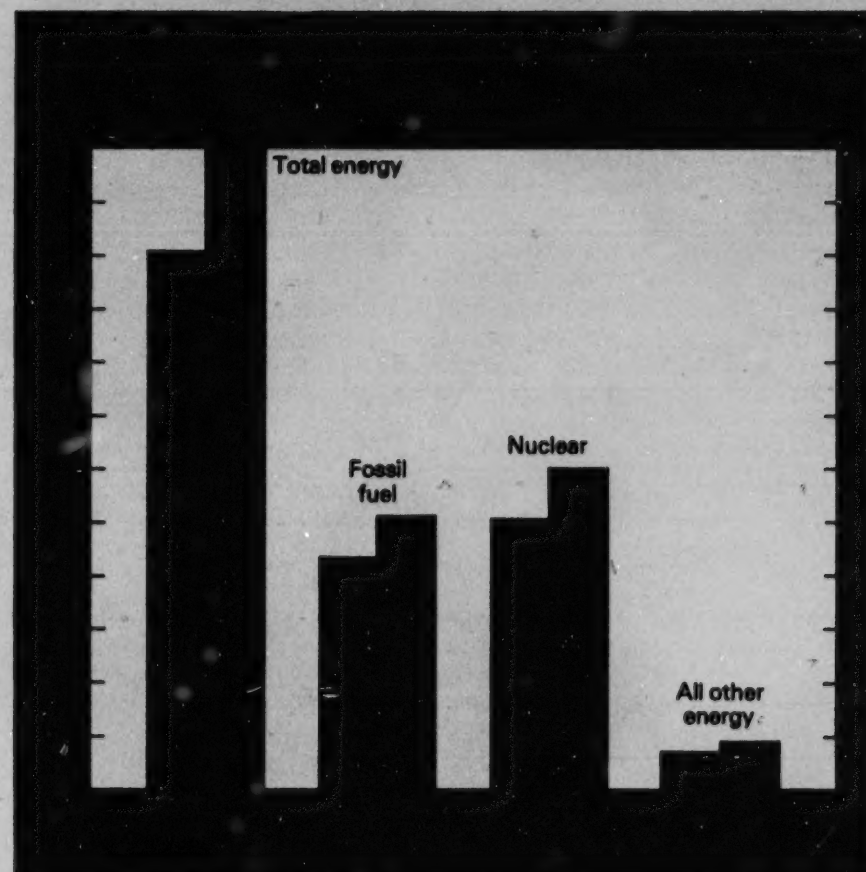
By primary source, 50 percent of the total energy R&D spending and 93 percent of the Federal spending were directed toward nuclear energy research and development, mostly nuclear fission. Another 42 percent of the total and two-thirds of the company funds were devoted to fossil fuel research and development, primarily oil. Solar energy research and development, although small in relation to other sources, experienced a large relative rise in funds from \$2 million in 1973 to \$7 million in 1974.

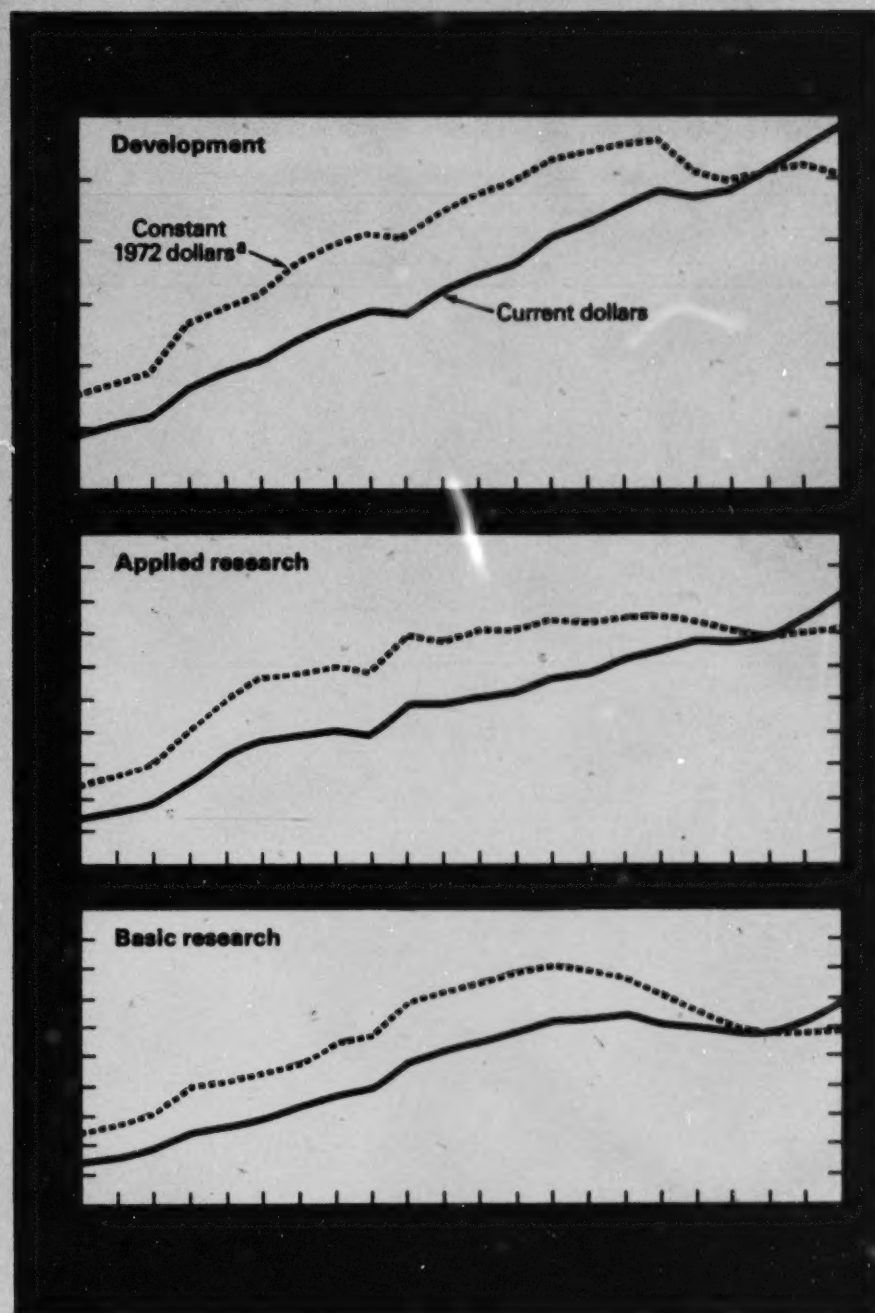
Industry's spending for pollution abatement research and development increased by 7 percent—from \$603 million in 1973 to \$646 million in 1974. A 4-percent decline to \$621 million was expected in 1975. Auto emission R&D spending, although included here under air pollution, may also be considered as energy research and development.

The Federal Government sponsored only 8 percent of industry's pollution abatement R&D effort in 1974. Forty percent of the Federal funds were directed to the aircraft and missiles industry.

Well over one-half of the 1974 company R&D funds for pollution abatement was spent by the motor vehicles industry. The remainder was distributed among a large number of industries, led by the chemicals, petroleum, machinery, electrical equipment, and aircraft and missiles industries.

By type, air pollution abatement research and development received three-quarters of the 1974 total.





Basic Research, Applied Research, and Development

Total basic research expenditures by industrial firms totaled \$683 million in 1974, which represented 17 percent of all basic research performed in the United States. Companies spent \$4.1 billion for applied research and \$17.6 billion for development. These funds accounted for 55 percent and 85 percent, respectively, of the national totals.

BASIC RESEARCH, BY INDUSTRY

Basic research performance in industry increased 10 percent above the 1973 level to \$683 million in 1974. In constant dollars, however, the increase amounted to less than 1 percent. As in other years, the chemicals industry led in basic research performance, with expenditures of \$267 million, rising by 20 percent from 1973 and representing 39 percent of the 1974 total. Electrical equipment and aircraft companies accounted for an additional 27 percent and 8 percent, respectively, with all other industries sharing 26 percent.

The year 1974 saw a continuation of the trend toward de-emphasis of basic research by industrial firms. The basic research share of total company R&D funds has decreased every year since its peak in 1963, from 7.0 percent in that year to 3.7 percent in 1974. Since the late sixties, pressures on profits have influenced firms to initiate cost-cutting measures wherever these could most easily be effected. Basic research, with longer term potential, has been increasingly selected as a likely candidate for reduction. Due to the shorter term, product-related orientation of applied research and development, these activities have been relatively isolated from significant cost reductions.

Of the 519 R&D-performing companies with 1974 employment greater than 5,000, 204 did basic research. The percentage of companies doing basic research within the chemicals and electrical equipment and communication industries was substantially higher than the all-industry average—66 percent and 46 percent, respectively. Companies in these two industries made up almost one-third of all the companies performing basic research.

BASIC RESEARCH, BY SOURCE

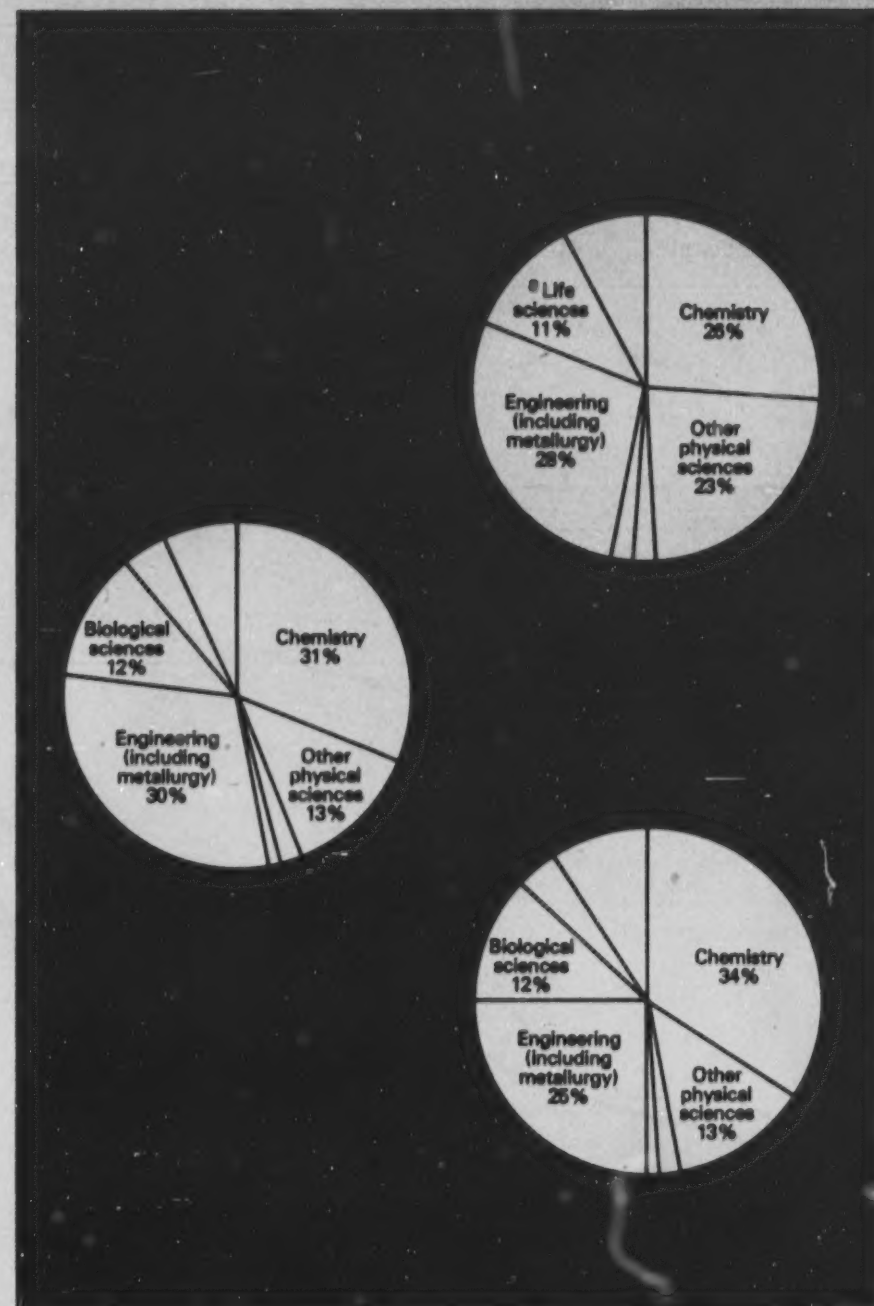
In 1974 over 75 percent of industry's basic research was financed by companies' own R&D funds, amounting to \$523 million. The chemicals industry (including basic research-intensive drug companies which historically have funded very little of their basic research effort with Federal funds) was the leading performer of company-sponsored basic research, allocating \$219 million, or 10 percent of its own R&D funds to basic research, and performing over 40 percent of all company-sponsored basic research. Electrical equipment firms were the second largest performers of company-sponsored basic research, with \$117 million, accounting for 4 percent of their own R&D funds and over 20 percent of all company-sponsored basic research in 1974.

The Federal Government allocated about 2 percent of its R&D support in industry to basic research. This amounted to \$159 million, or almost 6 percent of all Federal basic research spending in the economy. Over 80 percent of Federal basic research funding in industry went to companies in the electrical equipment industry (\$64 million), chemical industry (\$49 million), and aircraft and missiles industry (\$19 million). An additional 8 percent (\$13 million) was contracted to nonmanufacturing industries.

BASIC RESEARCH, BY FIELD OF SCIENCE

Funds for basic research by field of science fluctuated little throughout the 1967-74 period. Almost one-half of all industrial basic research in 1974 was in the physical sciences—\$318 million; chemistry alone accounted for \$230 million. Engineering represented 25 percent of the total and the life sciences 16 percent. There has been little change in these relationships since 1967, the first year for which comparable data are available.

In 1974 the chemicals industry funded 58 percent and 53 percent of all basic research in the physical and life sciences, respectively. Basic research in engineering totaled \$169 million; over two-thirds of this work was financed by companies in the electrical equipment and aircraft and missiles industries.



APPLIED RESEARCH AND DEVELOPMENT, BY INDUSTRY

Applied research and development spending by industry amounted to \$21.7 billion in 1974—7 percent above the 1973 figure. About one-half of this was spent by the companies in the electrical equipment and aircraft and missiles industries, each spending \$5.3 billion.

The aircraft industry financed over three-fourths of its applied research and development performance with Federal funds in 1974, and electrical equipment companies reported almost 50 percent Federal support. These two industries spent \$6.6 billion of Federal funds on applied research and development in 1974, over 80 percent of all Federal applied research and development support.

The electrical equipment industry was the leading performer of company-sponsored applied research and development, spending \$2.8 billion in 1974. Other industries spending relatively large amounts of company R&D funds on applied research and development were chemicals (\$1.9 billion), machinery (over \$1.9 billion), and motor vehicles (over \$1.9 billion).

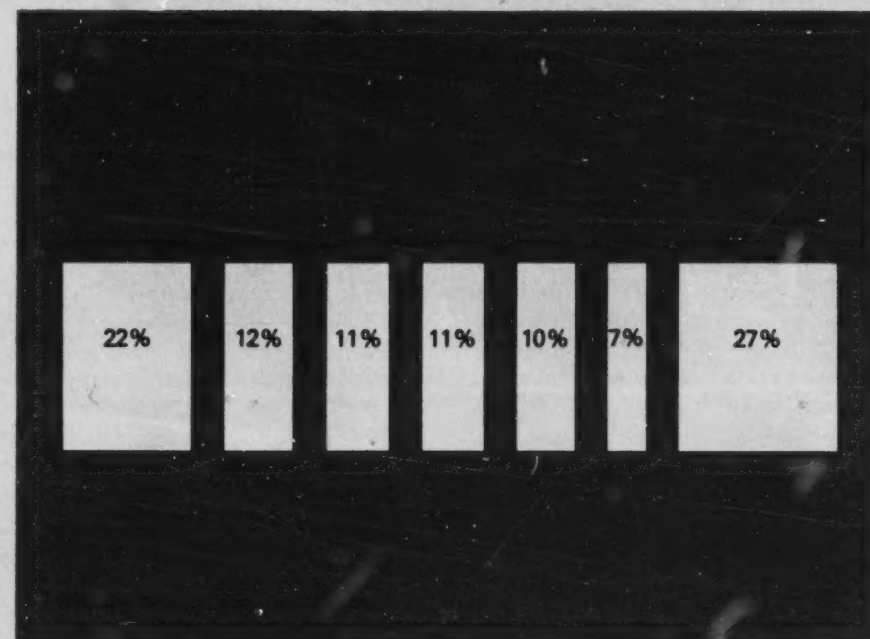
APPLIED RESEARCH AND DEVELOPMENT, BY PRODUCT FIELD

Applied research and development by product field shows the allocation of R&D funds by companies in different product areas. Almost three-fourths of the industrial applied research and development funds (\$21.7 billion) were spent in six product fields in 1974: Electrical equipment and communication, 22 percent; machinery, 12 percent; guided missiles and spacecraft, 11 percent; aircraft and parts, 11 percent; motor vehicles and other transportation equipment, 10 percent; and chemicals, except drugs and medicines, 7 percent.

The Federal Government supported 38 percent of this product/process-oriented applied research and development in 1974—2 percent less than in 1973. This decline has continued annually since 1963 when Federal support was 59 percent. Over one-quarter of this Federal support was to sponsor work on guided missiles and spacecraft, \$2.2 billion, with an additional 20 percent going to aircraft and parts. Electrical equipment and communication received \$2.2 billion, or 27 percent of the Federal funding.

Since many companies are active in a number of diverse areas, it is helpful to know what percent of applied research and development dollars was directed towards the companies' major products. The following table shows the specialization ratios for selected industries. These ratios were derived by calculating the percent of total applied research and development directed to each industry's primary products.

Industry	1974 specialization ratios
Chemicals and allied products	79
Professional and scientific instruments	78
Aircraft and missiles	74
Motor vehicles and other transportation equipment	73
Primary metals	67
Machinery	66
Fabricated metal products	66
Electrical equipment and communication ..	58
Petroleum refining and extraction	55



Geographic Distribution of R&D Funds

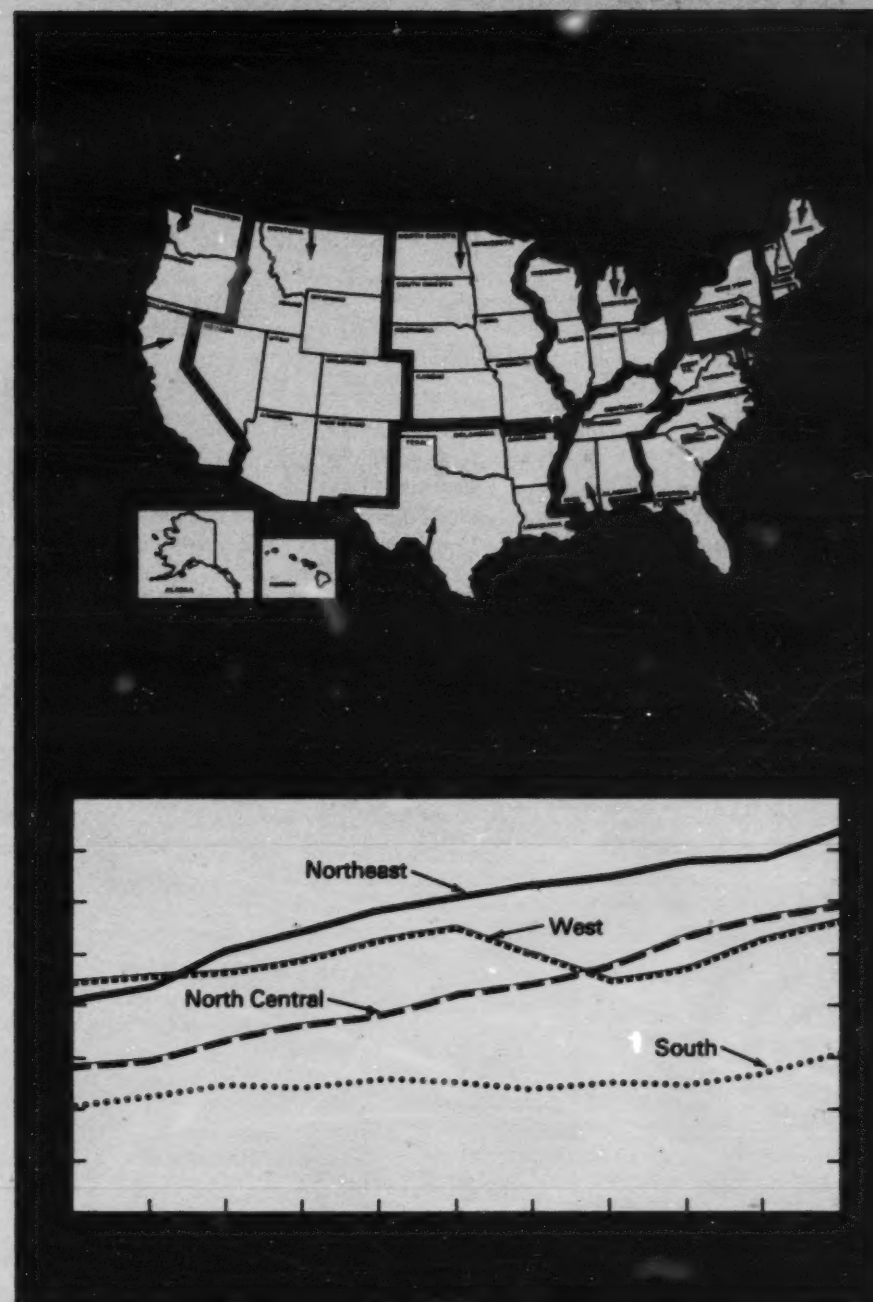
The seven States leading in industrial R&D performance—California, New York, Michigan, Pennsylvania, New Jersey, Massachusetts, and Ohio—accounted for 62 percent of the national R&D total in 1974—1 percentage point lower than in 1973. California, with \$4.4 billion in 1974, led all States in industrial R&D performance. Its share of the total was 19 percent, down from a high of 28 percent in 1964.

Industrial R&D funding increased between 1973 and 1974 in all four geographic regions. The largest percentage increase was in the South, 13 percent; followed by the Northeast, 7 percent; the West, 7 percent; and the North Central, 5 percent. In absolute terms, the Northeast still leads with \$7.3 billion.

The only geographic division to experience a decline in industrial R&D spending in 1974 was the West North Central, where expenditures fell by 1 percent. The divisions with larger-than-average increases were West South Central, 22 percent; Mountain, 12 percent; South Atlantic, 10 percent; East South Central, 9 percent; and Middle Atlantic, 8 percent. The Middle Atlantic division spent the largest dollar amount, \$5.2 billion.

The Pacific division was the leading recipient of Federal support with \$3.4 billion, and the Middle Atlantic division followed with \$1.5 billion—together they accounted for 59 percent of the Federal total. California was the leading State with \$3.1 billion, or 37 percent of Federal monies. Federal funds accounted for more than one-half of the R&D support in the Pacific and East South Central divisions.

Michigan had the largest amount of company financing—\$2.0 billion—96 percent of its total. New York and California followed with \$1.6 billion and \$1.3 billion, respectively. New Jersey and Pennsylvania each had company financing in excess of \$1 billion. Together these five States represented 50 percent of total company funds for industrial R&D in 1974.



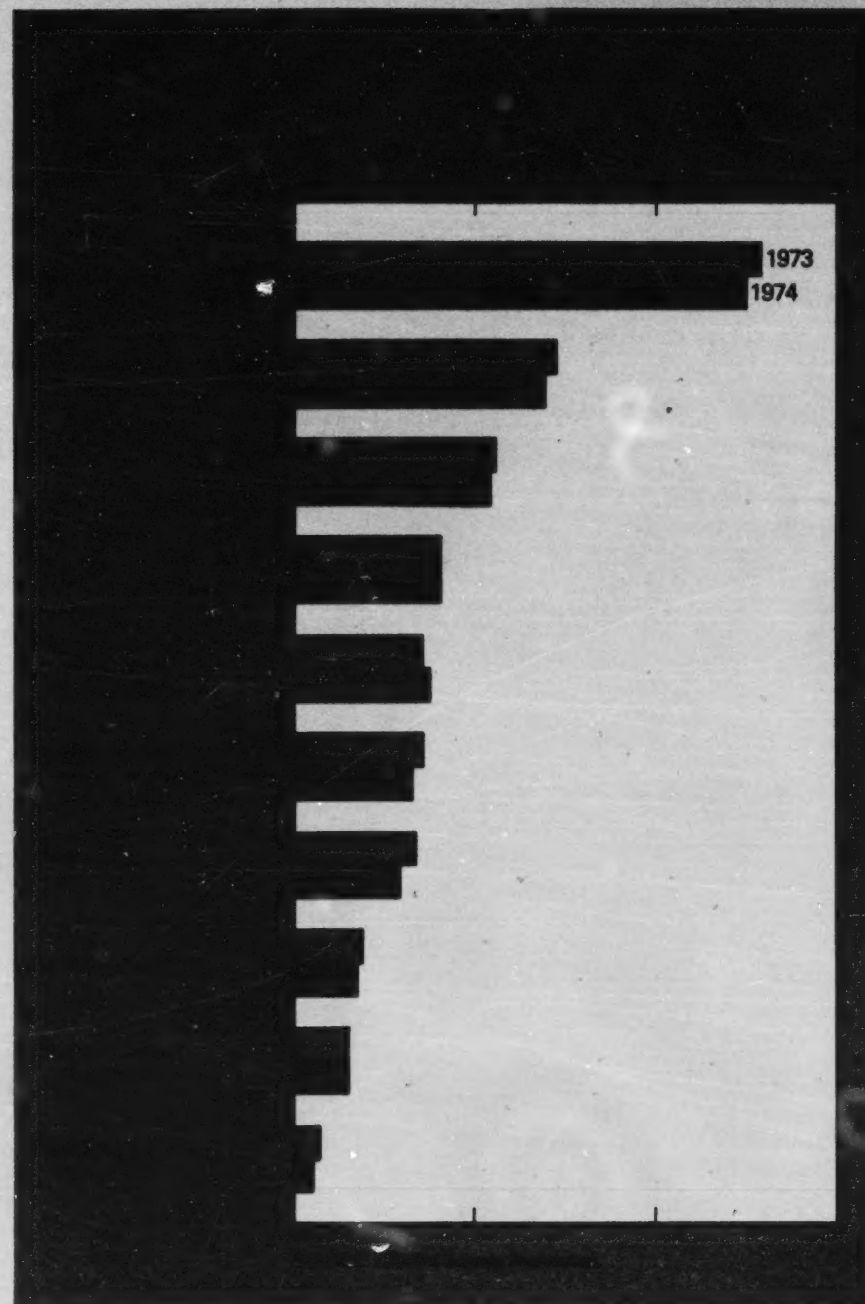
R&D Funds Related to Net Sales and Employment

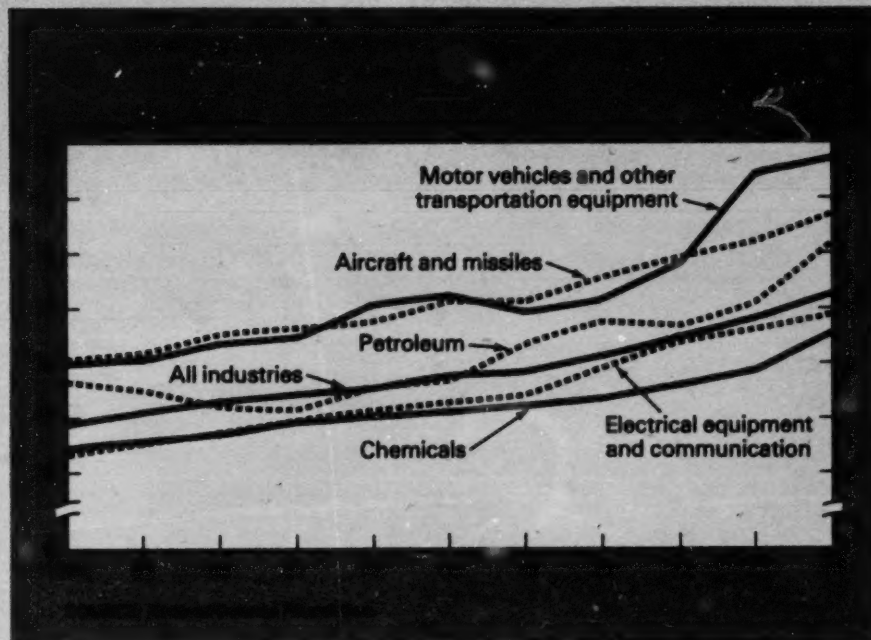
Total R&D spending in manufacturing companies averaged 2.9 percent of the net sales of these companies in 1974. The ratio fell from 3.3 percent in 1973, continuing the general decline from the 1964 peak of 4.6 percent. Total R&D funds have increased every year but one since 1964; however, net sales have increased at a faster pace, causing the ratio to decline.

Only one major industry group, motor vehicles, experienced an increase in its R&D/net sales ratio in 1974. In this industry R&D funds remained nearly constant while net sales decreased, pushing the ratio up from 3.5 to 3.7. The ratios remained at 1973 levels in five industries: food, textiles, lumber, paper, and stone, clay, and glass products. All other industries experienced declines in their ratios between 1973 and 1974.

The largest companies, those with 25,000 or more employees, performed the greatest amount of research and development in relation to net sales. The ratio for these companies was 3.9 in 1974, while all other size classes ranged from 1.5 to 1.7.

The ratio of company R&D funds to net sales fell slightly from 2.0 in 1973 to 1.9 in 1974. This ratio has been relatively stable over time, ranging between 1.9 and 2.2 since 1963. Again, only the motor vehicles industry increased its ratio in 1974, from 2.9 to 3.2. Of the remaining leading industries, three remained at 1973 levels—machinery, 3.4; electrical equipment, 3.6; and aircraft and missiles, 2.8—while one, chemicals, declined from 3.1 to 2.8.

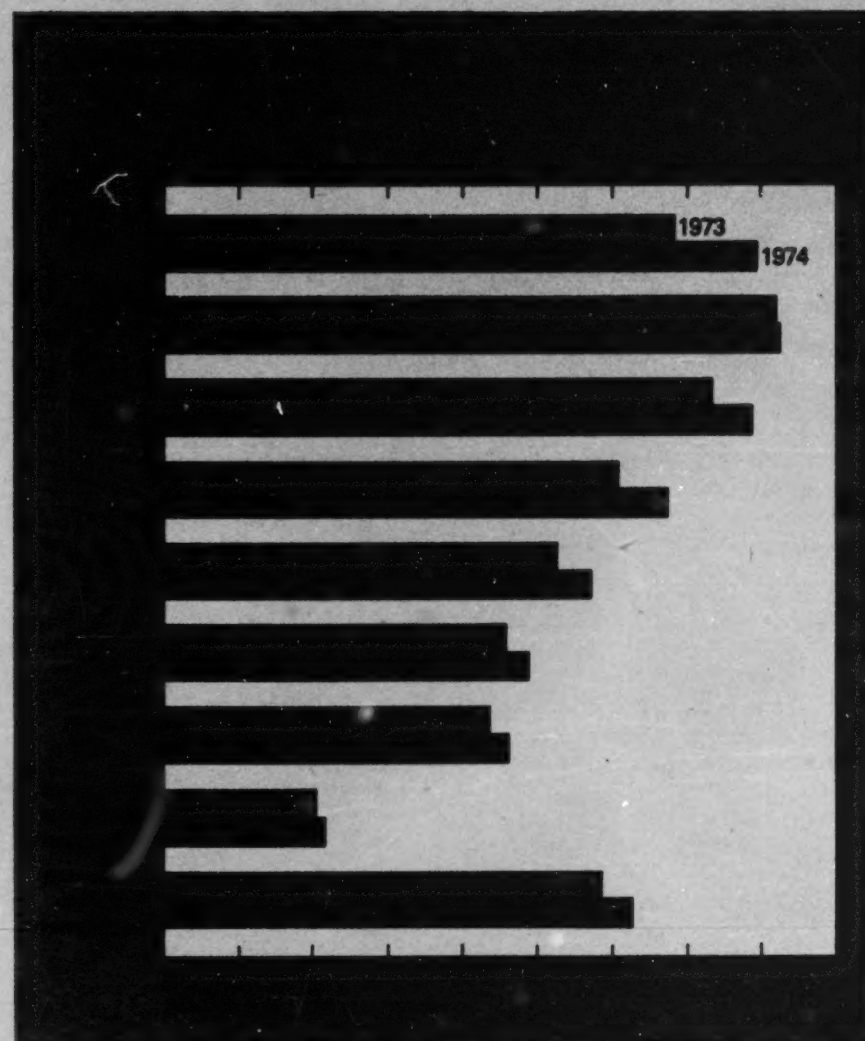




The cost per R&D scientist or engineer continued to rise in 1974, reaching \$62,500—7 percent more than the previous year. Above-average cost ratios were reported in three industries: motor vehicles, \$89,200; aircraft and missiles \$77,200; and petroleum, \$72,000. The high ratios in the first two of these industries reflect the high development costs associated with their end products.

The R&D cost per scientist or engineer in industry tends to increase with company size, whether ranked by employment or R&D program. As the accompanying chart shows, the companies with the largest R&D programs also had the highest cost ratios. The ratios increase, in terms of company size, as follows:

Company size, by number of employees	Cost per scientist or engineer
Less than 1,000	\$34,300
1,000—4,999	45,000
5,000—9,999	47,600
10,000—24,999	50,300
25,000 or more	72,300



Federally Funded Research and Development Centers

Federally Funded Research and Development Centers (FFRDC's) are organizations administered by industrial firms, universities and colleges, or other nonprofit institutions. These organizations perform research and development almost exclusively for Federal agencies. R&D activities undertaken by FFRDC's administered by industrial organizations are classified with those of the administering firm.

During 1974 there were 51 FFRDC's. Listed below are the eight FFRDC's which were administered by industry accompanied by the names of the administering firms.²

FFRDC	Administered by:
Bettis Atomic Power Laboratory	Westinghouse Electric Corporation
Hanford Engineering Development Laboratory	Westinghouse-Hanford Corporation
Knolls Atomic Power Laboratory	General Electric Company
Mound Laboratory	Monsanto Research Corporation
National Reactor Testing Station	Aerojet Nuclear Corporation
Oak Ridge National Laboratory	Union Carbide Corporation
Sandia Laboratory	Western Electric Company, Inc.- Sandia Corporation
Savannah River Laboratory	E.I. duPont de Nemours & Company, Inc.

² Because of the Bureau of Census confidentiality requirements, this listing was obtained from National Science Foundation, *Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1972, 1973, and 1974*, Vol. XXII (NSF 74-300) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1973).

Total R&D performance in industry-administered FFRDC's total \$648 million in 1974—19 percent above the 1973 amount. By character of work, R&D expenditures increased 36 percent for basic research, 9 percent for applied research, and 20 percent for development.

In 1974 FFRDC spending accounted for almost 8 percent of all Federal funds to industry, but this varied by type of activity. FFRDC's spent 31 percent of Federal basic research funds, 11 percent of the applied research, and 7 percent of development funds. Because of the substantial increase in FFRDC funding between 1973 and 1974, almost all of the 1.3-percent increase in Federal support to industry was accounted for by these organizations.

The employment of FTE R&D scientists and engineers in these centers increased from 6,800 in January 1974 to 7,300 in January 1975. Total employment increased by 400 to 24,700 in 1974.

Industry-administered FFRDC's—funds and manpower: 1973-74

[Dollars in millions]

	1973	1974
Total R&D funds	\$545	\$648
Basic research	36	49
Applied research	110	120
Development	399	479
Total employment	24,300	24,700
	January 1974	January 1975
FTE R&D scientists and engineers	6,800	7,300

APPENDIXES

- A. Technical Notes
- B. Statistical Tables
- C. Reproduction of Covering Letters,
Questionnaire, and Instructions

APPENDIX A Technical Notes

Scope of Study

The National Science Foundation sponsored its first survey of industrial research development in 1953. Since then, the scope of the survey has gradually been expanded and refined in response to an increasing need for more detailed information on the Nation's R&D effort.

The 1974 industry survey is the 18th in the annual series sponsored by the Foundation and conducted by the Bureau of the Census, U.S. Department of Commerce. The Foundation also sponsored two industry surveys covering the 1953-56 period, which were conducted by the Bureau of Labor Statistics (BLS), U.S. Department of Labor.¹ Data obtained in the BLS survey are not directly comparable with the Census figures for 1957-73 because of methodological and other differences in the surveys conducted by the two agencies. In addition, the Census surveys, beginning in 1957, have collected data on the R&D activities of Federally Funded Research and Development Centers (FFRDC's) operated by business firms, whereas the earlier BLS surveys did not. To account for the R&D performance of these research centers in 1956, Census adjusted data for that year (collected in the 1957 survey) to provide comparable trend data for 1956 and earlier years.

Data on scientific manpower are not directly comparable with data in surveys formerly conducted by the Bureau of Labor Statistics. For example, the reporting unit used in the Census surveys of industrial research and development is the company, which is defined to include all establishments under common ownership or control. Surveys of scientific and technical personnel conducted by the Bureau of Labor Statistics were on an establishment-reporting-unit basis. Further, the Census surveys obtain data on the number of R&D scientists and engineers on a full-time-equivalent (FTE) basis, unlike the surveys of the Bureau of Labor Statistics in which data were provided in terms of scientists and engineers primarily employed in research and development. Other variations in the two sets of data may be the result of different offices in the same company preparing the estimates, or the varying response rates of the two surveys.

The statistics presented in this report are subject to response and concept errors caused by differences between survey and industry concepts and definitions of R&D activities and by variations in company accounting procedures. Consequently, the accuracy of the data provided by respondents is subject to some variation.

Since the first industry survey in 1953, the quality of the data has improved substantially. This results mainly from more

accurate and sophisticated accounting procedures adopted by respondents. In addition, the Foundation and the Bureau of the Census have continued their efforts to reduce response and concept errors arising from difficulties in interpreting or applying survey definitions.

Survey Definitions²

Research and development—Basic and applied research in the sciences and engineering and the design and development of prototypes and processes. This definition excludes quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or psychology, and other nontechnological activities or technical services.

Basic research—Original investigations for the advancement of scientific knowledge not having specific commercial objectives, although such investigations may be in fields of present or potential interest to the reporting company.

Applied research—Investigations directed to the discovery of new scientific knowledge having specific commercial objectives with respect to products or processes. This definition differs from that of basic research chiefly in terms of the objectives of the reporting company.

Development—Technical activities of a nonroutine nature concerned with translating research findings or other scientific knowledge into products or processes. Does not include routine technical services to customers or other activities excluded from the above definition of research and development.

Funds for research and development—Operating expenses incurred by a company in the conduct of research and development in its own laboratories or other company-owned or -operated facilities. Includes wages and salaries, materials and supplies consumed, property and other taxes, maintenance and repairs, depreciation, and an appropriate share of overhead, but excludes capital expenditures. Funds for R&D performance are expressed in current dollars rather than in constant dollars.

Federally financed research and development—Receipts for work done by the company on R&D contracts or subcontracts and R&D portions of procurement contracts and subcontracts.

Company-financed research and development—Cost of the company-sponsored research and development performed within the company. Does not include company-financed research and development contracted to outside organizations, such as research institutions, universities and colleges, or other nonprofit organizations.

¹ National Science Foundation, *Science and Engineering in American Industry, Final Report on a 1953-54 Survey* (NSF 56-16) and *Science and Engineering in American Industry, 1956* (NSF 59-30) (Washington, D.C.: 20003: Suppl. of Documents, U.S. Government Printing Office, 1956 and 1960).

² For more detailed information on definitions, as well as the instructions for individual items covered in the survey questionnaire, see appendix C.

R&D scientists and engineers—The January number of those engaged full time in research and development and the full-time equivalent (FTE) of those working part time. Scientists and engineers are defined as persons engaged in scientific or engineering work at a level which requires a knowledge of physical, life, engineering, or mathematical sciences equivalent at least to that acquired through completion of a 4-year college course with a major in one of those fields.

Employment—Total number of persons employed by the company in all activities during the pay period which includes the 12th of March. These data are not completely comparable with employment of R&D scientists and engineers data which are collected (1) as of January and (2) on a man-year basis.

Net sales and receipts—Recorded dollar values for goods sold or services rendered by a company to customers outside the company, including the Federal Government, less such items as returns, allowances, freight charges, and excise taxes. Excludes domestic intracompany transfers as well as sales by foreign subsidiaries, but includes transfers to foreign subsidiaries. Net sales and receipts figures are expressed in current dollars rather than constant dollars.

Geographic area covered—Includes only those operations located in the 50 States and the District of Columbia.

Explanation of Tabular Data

Industry classification—Industries and industry groups shown separately in statistical tables are classified according to their Standard Industrial Classification Manual¹ codes as follows:

- Food and kindred products (20)
- Textiles and apparel (22,23)
- Lumber, wood products, and furniture (24, 25)
- Paper and allied products (26)
- Chemicals and allied products (28)
 - Industrial chemicals (281-82)
 - Drugs and medicines (283)
 - Other chemicals (284-89)
- Petroleum refining and extraction (29, 13)⁴
- Rubber products (30)
- Stone, clay, and glass products (32)

- Primary metals (33)
 - Ferrous metals and products (331-32, 3391, 3399)
 - Nonferrous metals and products (333-36, 3392)
- Fabricated metal products (34)
- Machinery (35)
 - Office, computing, and accounting machines (357)
- Electrical equipment and communication (36, 48)⁴
 - Radio and TV receiving equipment (365)
 - Electronic components (367)
 - Communication equipment and communication (366, 48)
 - Other electrical equipment (361-64 and 369)
- Motor vehicles and motor vehicles equipment (371)
- Other transportation equipment (373-75, 379)
- Aircraft and missiles (372, 19)⁵
- Professional and scientific instruments (38)
 - Scientific and mechanical measuring instruments (381-82)
 - Optical, surgical, photographic, and other instruments (383-87)
- Other manufacturing industries—tobacco manufacturers (21), printing and publishing (27), leather products (31), and miscellaneous manufacturing industries (39)
- Nonmanufacturing industries—agriculture, forestry, and fisheries (07-09); mining (10-12, 14); contract construction (15-17); transportation and other public utilities (41-47, 49); wholesale and retail trade (50-59); finance, insurance, and real estate (60-67); and selected service industries (739, 807, 891).

Company size-class—The size of a company as determined by the total number of its employees. The five company size-classes used in this report are less than 1,000 employees; 1,000 to 4,999 employees; 5,000 to 9,999 employees; 10,000 to 24,999 employees; and 25,000 or more employees.

Classification of reporting units—The company or corporate family which includes all establishments under common ownership or control. Similarly, each company was classified in a single size-category on the basis of its total employment.

Cost per R&D scientist or engineer—The number of R&D scientists and engineers used to estimate the cost per R&D scientist or engineer for 1957-73 is the arithmetic mean of the numbers of R&D scientists and engineers reported in each industry for January in two consecutive years.

Nonavailability of certain statistics—Estimates withheld for not meeting publication standards for reasons such as excessively high associated sampling error of estimate; high rate of imputation because of failure of companies to report; possible disclosure of data on an individual company; or cases where data were inconsistent for inclusion in a time series. In tables, the term "not separately available but included in total" indicates statistics could not be published for any of these reasons.

Method of computation—Detailed statistics in the tables may not add to totals or subtotals because of rounding. Also, percentages were calculated on the basis of thousands of dollars and may differ from those based on the rounded figures shown.

Methodology of Survey⁶

The sample used for the 1974 Survey of Industrial Research and Development represented all manufacturing industries and those nonmanufacturing industries known, on the basis of earlier, more detailed samples, to conduct or to finance research and development. The sampling unit for the survey was the company, defined as a business organization consisting of one or more establishments under common ownership or control. All manufacturing companies with 1,000 or more employees in 1967, as determined from the 1967 Economic Censuses Enterprise Statistics⁷ multiunit file, were included in the sample with certainty. Manufacturing companies with fewer than 1,000 employees were sampled at rates depending upon their industry and employment size, based upon the 1967 Economic Censuses Enterprise Statistics multiunit file and the 1967 Census of Manufactures universe file. For selected nonmanufacturing industries (SIC 7391, 7392, 7397, and 8911) the sample was drawn from the 1967 Economic Censuses Enterprise Statistics file. For all other nonmanufacturing industries, the sample was based on the 1966 records of the Social Security Administration.

Approximately 8,000 manufacturing and nonmanufacturing companies are represented in the 1974 sample. More than 1,800 of the companies included are certainty companies which accounted for almost 95 percent of the total R&D performance funds. Appendix table A-1 shows the probabilities of selection applied for each industry-size stratum. The probabilities of being selected in the survey range from 1 chance in 200 (.005) to certainty (1.000).

Each year approximately 1,200 certainty companies and 200 noncertainty companies are mailed the report form. Companies are mailed the report form providing their total research and

¹ Executive Office of the President, Bureau of the Budget, *Standard Industrial Classification Manual, 1967* (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office). Industry group code numbers are shown in parentheses.

⁴ For the purposes of this study, crude petroleum and extraction (13) is grouped with petroleum refining (29), and communication (48) is grouped with electrical equipment (36), in the manufacturing group of industries.

⁵ Companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts because of close similarity of R&D activities carried out by major companies in the two industries.

⁶ This section was prepared in the Industry Division of the Bureau of the Census, the collecting and compiling agent for the National Science Foundation in this survey.

⁷ Department of Commerce, Bureau of the Census, *Enterprise Statistics: 1967* (Washington, D.C. 20540: Supt. of Documents, U.S. Government Printing Office.)

development was \$200,000 or more in the year of resampling (the last resample was 1971). Companies below \$200,000 of total research and development are mailed only in the year of the resample and are imputed at that level until a new resample is drawn.

Each year the annual Department of Defense (DOD) and National Aeronautics and Space Administration (NASA) lists of R&D contractors are reviewed to ensure that the large contractors are included in the sample. For the 1974 survey, the 80 largest companies from the DOD list and the 50 largest NASA contractors were included in the sample with certainty regardless of their industry class and employment size. The 80 largest companies from the DOD list accounted for 82 percent of the total contract awards of all companies included on the DOD list. The 50 largest companies from the NASA list accounted for 81 percent of the total contract awards of all companies included on the NASA list.

The particular sample selected is one of a large number of samples of the same type and size that, by chance, might have been selected. Estimates from each of the different samples would differ somewhat from each other, and from the results of a complete canvass conducted under essentially the same conditions as the survey. This variation among the possible estimates is defined by the sampling error, measured in standard error units. The complete canvass total would be included in the range—

1. From one standard error below to one standard error above the derived estimate for about two-thirds of all possible samples.
2. From two standard errors below to two standard errors above the derived estimate for about 95 percent of all possible samples.
3. From three standard errors below to three standard errors above the derived estimate, almost always.

These values may be interpreted as defining approximate probabilities that the estimate shown would differ from a complete canvass total by as much as one, two, or three standard errors, respectively. For example, if an estimate is shown as 400, with an associated relative standard error of 2 percent, the chances are roughly two out of three that the complete canvass total would lie between 392 and 408; the chances are roughly 19 out of 20 that the complete canvass total would lie between 384 and 416; and it is almost certain that the complete canvass total would lie between 376 and 424.

As stated, the standard error refers only to sampling variations. In addition to the sampling errors as measured by the standard error, the estimates are subject to errors in response, coding, processing, and imputation for nonresponse. These non-sampling errors would also occur if a complete canvass were to be conducted under the same conditions as the survey.

The 1974 standard errors of estimates for each industry, for all companies and for those with fewer than 1,000 employees, are shown in appendix table A-2.

The forms for the survey were mailed in February 1975, and nonrespondents were followed up by mail. The basic forms used were Form RD-1 and RD-11, but since total R&D performance funds and total Federal funds expended by industry for research and development are included in the Census Bureau's mandatory statistical program, the very few large companies that did not reply were mailed the Census Form MA-121, which collects total R&D and Federal R&D funds. Less than 1 percent of total R&D funds were obtained in this way and included in this report.

Appendix table A-3 shows the percent of total R&D funds for which a distribution by basic research, applied research, and development was estimated by the Bureau of the Census in the absence of respondent-distributed data for 1974.

Comparability of Data Over a Period of Several Years

In the surveys of industrial research and development, there has been substantial comparability over any 2-year period. This is because the respondent has had before him, on the same report form used in filing current data, the figures for the previous year as reported by the respondent and as entered on the form by the Census Bureau before mailing; the respondent has been asked to adjust the data for the previous year as necessary to make it comparable to those of the current year. Such adjustments have been made to reflect, for example, changes in reporting concepts or changes in company structure such as mergers or acquisitions. To maintain some measure of consistency, the employment-size classification of any company affected by such changes has been adjusted so that the company is tabulated in the same employment-size category for 2 consecutive years.

Some measure of the degree of change reflecting these adjustments in contrast to an actual change in R&D activity can be gained by comparing figures for the same year reported for two succeeding reporting periods, e.g., 1973 R&D statistics in the final report of the 1973 survey and the revised 1973 R&D statistics in the final report of the 1974 survey. The totals for broad classification are likely to be very close in the two reports, but in the finer detail, larger differences are noticeable. The results underscore the point that the measures are approximate and indicative rather than precise.

When tables covering more than 2 years were prepared for this report, it was not considered feasible to carry most revisions back more than one year.

Industry Codes for 1963-74^a

The industry codes appearing in the tables are based on the 1967 Standard Industrial Classification (SIC) Manual. The SIC classifications for individual companies for 1963-67 were originally determined by data reported in the 1963 Economic Censuses. Between 1963 and 1967, the SIC code for a company generally remained fixed and reflected that company's principal activity in 1963. However, under certain circumstances—such as the merger of two or more companies, the acquisition of one company by another, or the formation of "conglomerates"—the 1963 SIC code for a company could have changed.

Most industry groups were characterized by relatively minor changes in the SIC codes for companies classified in those groups, and the tabulated data for such groups remained substantially comparable between 1963 and 1967. Some industry groups, however, were characterized by significant changes in the SIC codes for companies originally classified in those groups in 1963. The effect of these changes became most noticeable toward the end of the 4-year intercensal period, with the result that revisions to industry totals resulting from these code changes tended to reflect disproportionately large fluctuations between the data for 1967 and the year immediately preceding.

To remedy these apparent discrepancies, the data for affected industries were adjusted as follows: For companies changing industry codes between 1963 and 1967, the industry data for each of the 4 years affected (1964 through 1967) were estimated to have changed at the constant rate of 25 percent per year. Accordingly, the data for the industry in which such a company had been classified in 1963 were deflated by 25 percent per year for each of the years 1964-67. Similarly, the data for the industry in which such a company was classified in 1967 were inflated by 25 percent per year for each of the years 1964-67. The industry code assigned to a company for 1967 is also used to classify that company's activities for the years 1968-74.

The following measures were adjusted in this manner: Number of scientists and engineers; funds for research and development—total, Federal, and company; net sales; cost per R&D scientist and engineer; and basic research expenditures. These historical data appear, for example, in selected tables of the 1974 NSF publication on research and development in industry (see appendix tables B-3, B-6, B-9, B-24, B-30, B-35, and B-47). No adjustments were made in data for other measures.

^a For a discussion of industry codes for 1962 and earlier years, see National Science Foundation, *Research and Development in Industry, 1970, Funds, 1970: Scientists & Engineers*, Jan. 1971 (NSF 72-309) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1972).

Table A-1.—Sampling ratios used in the selection of manufacturing and nonmanufacturing companies included in the survey of industrial research and development, by industry and size of company, 1974

Industry	SIC code ¹	Companies with total employment of—				
		1-49	50-99	100-499	500-999	1,000 or more
Agriculture, forestry, and fisheries	07-09	(²)	0.010	0.020	0.200	1.000
Mining, except petroleum extraction	10-12.14	(²)	.050	.050	.100	1.000
Contract construction	15-17	(²)	.050	.100	.500	1.000
Food and kindred products	20	.005	.005	.033	.500	1.000
Textiles and apparel	22.23	.005	.005	.025	1.000	1.000
Lumber, wood products, and furniture	24.25	.005	.005	.050	.500	1.000
Paper and allied products	26	.005	.005	.050	1.000	1.000
Industrial chemicals	281-82	.083	.083	1.000	1.000	1.000
Drugs and medicines	283	.250	.250	1.000	1.000	1.000
Other chemicals	284-89	.007	.007	.333	1.000	1.000
Petroleum refining and extraction	29.13	.050	.050	1.000	1.000	1.000
Rubber products	30	.007	.007	.143	1.000	1.000
Stone, clay, and glass products	32	.005	.005	.143	1.000	1.000
Ferrous metals and products	331-32.3391.3399	.005	.005	.100	1.000	1.000
Nonferrous metals and products	333-36.3392	.005	.005	.500	1.000	1.000
Fabricated metal products	34	.005	.005	.100	1.000	1.000
Machinery	35	.005	.005	.100	1.000	1.000
Radio and TV receiving equipment	365	.067	.067	1.000	1.000	1.000
Communication equipment and electronic components	366-67.48	.025	.025	1.000	1.000	1.000

¹ Executive Office of the President, Bureau of the Budget, *Standard Industrial Classification Manual*, 1967 (Washington, D. C. 20402: Supt. of Documents, U. S. Government Printing Office.)

² Companies in this employment-size group and industry group were not sampled.

Industry	SIC code	Companies with total employment of—				
		1-49	50-99	100-499	500-999	1,000 or more
Other electrical equipment	361-64.369	.050	.050	.250	1.000	1.000
Motor vehicles and other transportation equipment	371.373-75.379	.014	.014	.333	1.000	1.000
Aircraft and missiles	372.19	.083	.083	1.000	1.000	1.000
Scientific and mechanical measuring instruments	381-82	.143	.143	1.000	1.000	1.000
Optical, surgical, photographic, and other instruments	383-87	.050	.050	1.000	1.000	1.000
Transportation, except railroads ¹	41-47	(²)	.020	.020	.100	1.000
Public utilities and sanitary services	49	(²)	.100	.500	1.000	1.000
Wholesale trade	50-52	(²)	.010	.020	.200	1.000
Retail trade	53-59	(²)	.010	.020	.200	1.000
Finance, insurance, and real estate	60-67	(²)	.010	.020	.200	1.000
Miscellaneous business services	739	.005	.200	.200	1.000	1.000
Medical and dental laboratories	807	(²)	1.000	1.000	1.000	1.000
Engineering and architectural services	891	.005	.500	1.000	1.000	1.000
Other manufacturing industries	21.27.31.39	.005	.005	.050	1.000	1.000
Other nonmanufacturing industries		(²)	.010	.020	.200	1.000

¹ Companies primarily engaged in rail transportation were not included in the sample because, according to earlier surveys, such companies account annually for a relatively small amount of research and development in terms of the national total (less than 0.25 percent).

Table A-2—Standard error of estimate (percentage) of funds for R&D performance for all company size groups and for companies with less than 1,000 employees, by industry: 1974¹

Industry	Total	Companies with less than 1,000 employees
Total	2	2
Food and kindred products	1	38
Textiles and apparel	2	2
Lumber, wood products, and furniture	7	33
Paper and allied products	1	34
Chemicals and allied products	1	28
Industrial chemicals	2	12
Drugs and medicines	2	8
Other chemicals	9	46
Petroleum refining and extraction	2	3
Rubber products	3	47
Stone, clay, and glass products	3	35
Primary metals	1	15
Ferrous metals and products	2	7
Nonferrous metals and products	1	20
Fabricated metal products	7	29
Machinery	1	18
Office computing and accounting machines	2	32
Electrical equipment and communication	2	11
Radio and TV receiving equipment	—	—
Electronic components	3	28
Communication equipment and communication	2	20
Other electrical equipment	2	11
Motor vehicles and motor vehicles equipment	2	20
Other transportation equipment	7	24
Aircraft and missiles	2	27
Professional and scientific instruments	2	8
Scientific and mechanical measuring instruments	3	13
Optical, surgical, photographic, and other instruments	2	6
Other manufacturing industries	2	6
Nonmanufacturing industries	2	1

¹ A description of the standard error of estimate is given in Appendix A under "Methodology of Survey." The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentage shown by the associated estimate. For example, the relative standard error of estimate for R&D performance for all company size groups in the food and kindred products

industry (SIC 20) is shown as 1 percent, and the associated total R&D estimate for this industry is shown as \$294 million dollars in the table entitled, "Funds for R&D Performance by Industry and Selected Company Size Groups, 1974. The standard error of estimate, then, is .01 times 294 or 2.94.

² Less than 0.5 percent.

Table A-3.—Percent of total R&D funds for which a distribution by basic research, applied research, and development was estimated in the absence of respondent distributed data: 1974

Industry	SIC Code	Percent
Total		10
Food and kindred products	20	9
Textiles and apparel	22,23	24
Lumber, wood products, and furniture	24,25	6
Paper and allied products	26	3
Chemicals and allied products	28	15
Industrial chemicals	281-82	13
Drugs and medicines	283	18
Other chemicals	284-87,289	18
Petroleum refining and extraction	29,13	5
Rubber products	30	20
Stone, clay, and glass products	32	8
Primary metals	33	19
Ferrous metals and products	331-32,3391,3399	31
Nonferrous metals and products	333-36,3392	6
Fabricated metal products	34	19
Machinery	35	6
Office, computing, and accounting machines	357	2
Electrical equipment and communication	36,48	11
Radio and TV receiving equipment	365	1
Electronic components	367	1
Communication equipment and communication	366,48	10
Other electrical equipment	361-64,369	3
Motor vehicles and motor vehicles equipment	371	2
Other transportation equipment	373-75,379	22
Aircraft and missiles	372,19	2
Professional and scientific instruments	38	44
Scientific and mechanical measuring instruments	381-82	3
Optical, surgical, photographic, and other instruments	383-87	50
Other manufacturing industries	21,27,31,39	15
Nonmanufacturing industries	07-12,14-17,41-47,49-67,739,807,891	22

¹ More than 50 percent.

² Less than 1 percent.

APPENDIX B Statistical Tables

In all tables of this report—

- Details may not add to totals because of rounding.
- Percentages were calculated on the basis of thousands of dollars and may differ from those based on the rounded figures shown.
- Percentage changes are increases unless otherwise indicated.

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Table B-1.—Trends in funds for industrial research and development, by source of funds: 1963-74

(Dollars in millions)

Year	Total R&D		Federal		Company ¹	
	Amount	Percent change from previous year	Amount	Percent of total	Amount	Percent of total
1963	\$3,630	.....	\$1,430	39	\$2,200	61
1964 ²	4,070	12	1,750	43	2,320	57
1965 ²	4,640	14	2,180	47	2,460	53
1966	6,606	42	3,326	50	3,277	50
1967	7,731	17	4,336	56	3,396	44
1968	8,389	8	4,769	57	3,620	43
1969	8,618	16	5,636	65	3,983	41
1970	10,609	23	6,061	57	4,548	42
1971 ³	10,808	4	6,240	57	4,568	43
1972	11,464	6	6,434	56	5,030	44
1973	12,630	10	7,270	58	5,360	42
1974	13,612	8	7,520	55	6,092	44
1975	14,186	4	7,740	54	6,446	45
1976	15,548	10	8,332	54	7,216	46
1977	16,386	5	8,386	51	8,000	49
1978	17,429	6	8,660	49	8,769	51
1979	18,308	5	8,461	46	9,847	54
1970	18,063	-1	7,779	43	10,283	57
1971	18,311	1	7,606	42	10,705	58
1972	19,383	6	8,067	42	11,316	58
1973	20,921	8	8,226	39	12,695	61
1974	22,369	7	8,332	37	14,037	63

¹ Company funds include all funds for industrial R&D performed within company facilities except funds provided by the Federal Government. Excluded is company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other nonprofit organizations. In 1974 industrial firms contracted \$284 million in company-financed R&D projects to outside organizations.

² Estimates of funds by source were derived by interpolating source data obtained in the 1963 and 1966 industrial R&D surveys.

³ Funds by source estimated by the National Science Foundation.

Source: National Science Foundation.

Table B-2.—Selected data for R&D-performing companies, by industry: 1973 and 1974

[Dollars in millions]

Industry ¹	SIC code	Total R&D funds		Federal R&D funds		Company R&D Funds		R&D scientists and engineers		Net sales		Total employment (thousands)	
		1973	1974	1973	1974	1973	1974	January 1974	January 1975	1973	1974	1973	1974
Total .....	.....	\$20,921	\$22,369	\$8,225	\$8,332	\$12,696	\$14,038	358,200	357,500	\$663,298	\$796,457	14,461	14,386
Food and kindred products	20	288	294	1	1	287	293	6,600	7,000	64,988	77,453	967	976
Tobacco manufactures	21	35	39	0	0	35	39	900	900	8,263	9,015	111	116
Textile mill products	22	57	61	(²)	(²)	(²)	(²)	1,600	1,600	12,478	13,432	473	465
Apparel	23	7	7	(²)	(²)	(²)	(²)	300	300	2,833	2,920	153	153
Lumber and wood products, except furniture	24	29	35	(²)	(²)	(²)	(²)	800	900	5,590	6,391	134	137
Furniture and fixtures	25	26	32	(²)	(²)	(²)	(²)	900	1,100	3,370	3,690	124	124
Paper and allied products	26	194	219	1	1	193	218	4,900	5,300	27,608	32,025	647	647
Printing, publishing, and allied industries	27	36	41	(²)	(²)	(²)	(²)	1,000	1,100	5,398	6,065	145	146
Chemicals and allied products	28	2,062	2,364	205	216	1,857	2,147	41,600	43,400	59,797	75,416	1,063	1,106
Petroleum refining and extraction	29, 13	498	598	14	20	485	578	8,200	8,400	74,156	126,007	509	514
Rubber products	30	280	291	35	30	245	261	5,700	5,900	15,249	16,962	376	374
Leather and leather products	31	7	7	(²)	(²)	(²)	(²)	200	200	1,548	1,671	68	66
Stone, clay, and glass products	32	175	189	2	1	173	187	4,100	4,300	11,696	12,766	357	357
Primary metals	33	276	316	11	8	266	308	5,700	5,900	46,552	58,455	1,080	1,078
Fabricated metal products	34	273	288	12	13	262	274	6,900	7,100	22,905	25,386	711	710
Machinery	35	2,191	2,483	334	359	1,857	2,134	43,200	44,900	54,661	63,480	1,570	1,577
Electrical equipment and communication	36, 48	5,280	5,487	2,613	2,579	2,666	2,908	93,500	91,400	73,366	79,827	2,316	2,297
Transportation and ordnance	37, 19	7,520	7,734	4,397	4,451	3,123	3,283	99,200	93,700	113,480	113,211	2,468	2,327
Professional and scientific instruments	38	911	1,008	179	184	732	824	16,600	16,900	16,469	185,243	483	496
Miscellaneous manufacturing industries	39	80	87	(²)	(²)	(²)	(²)	1,900	2,000	4,413	4,484	149	142
Electric, gas, and sanitary services	49	93	70	8	10	76	60	700	800	13,105	16,535	190	190
Miscellaneous business services	739	457	522	360	405	97	117	8,200	8,900	1,937	2,364	67	72
Miscellaneous services	89	104	111	39	43	67	67	3,600	3,700	964	1,101	266	281

¹ Industries, industry groups, and product fields shown separately in statistical tables are classified according to *Standard Industrial Classification Manual* codes. See appendix A, footnote 3.² Not separately available but included in total.

Source: National Science Foundation.

Table B-3.—Funds for research and development, by industry and size of company: 1955-58 and 1963-74

[Dollars in millions]

Industry and size of company	SIC code	1955	1957	1958	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total		96,805	87,731	98,389	\$12,530	\$13,512	\$14,186	\$15,548	\$16,385	\$17,429	\$18,308	\$18,082	\$18,311	\$19,383	\$20,921	\$22,389
<i>Distribution by industry</i>																
Food and kindred products	20	64	74	83	130	144	157	184	183	187	205	235	246	280	288	294
Textiles and apparel	22,23	(¹)	15	26	30	32	38	51	57	88	90	98	99	81	84	88
Lumber, wood products, and furniture	24,25	(¹)	14	12	11	12	11	12	12	19	15	48	48	51	55	67
Paper and allied products	26	38	35	42	69	77	94	117	128	144	188	178	187	198	194	219
Chemicals and allied products	28	841	705	792	1,239	1,284	1,256	1,407	1,507	1,589	1,669	1,789	1,819	1,998	2,082	2,364
Industrial chemicals	281-82	480	503	583	805	885	908	918	988	988	1,013	1,040	1,030	1,042	1,138	1,322
Drugs and medicines	283	94	104	128	216	234	287	308	343	383	434	464	510	547	516	703
Other chemicals	284-89	87	98	111	214	185	181	181	198	210	212	282	289	307	312	338
Petroleum refining and extraction	29,13	182	211	248	317	383	397	371	371	437	487	515	505	488	486	598
Rubber products	30	(¹)	107	89	198	188	182	186	182	205	217	220	230	284	280	281
Stone, clay, and glass products	32	90	99	75	100	108	112	117	138	142	188	187	185	185	175	189
Primary metals	33	90	108	131	183	195	213	232	242	281	297	275	272	281	278	318
Ferrous metals and products ^a	331-32,3381,3399	(¹)	84	80	105	118	128	139	135	135	138	148	144	138	147	183
Nonferrous metals and products	333-36,3392	(¹)	44	51	77	75	85	93	107	115	121	128	128	122	130	153
Fabricated metal products	34	116	135	182	183	148	146	164	183	183	182	200	233	241	273	288
Machinery	35	543	689	781	958	1,015	1,085	1,217	1,328	1,477	1,536	1,849	1,773	1,980	2,191	2,493
Office, computing, and accounting machines	367	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	1,215	1,319	1,539
Electrical equipment and communication	36,48	1,516	1,804	1,989	2,886	2,972	3,200	3,828	3,867	4,105	4,401	4,382	4,534	4,918	5,290	5,487
Radio and TV receiving equipment	365	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	47	45	55	57	70	84	48	49	51
Electronic components	367	(¹)	748	868	1,773	1,872	1,989	2,249	2,425	2,538	2,713	2,738	2,881	3,117	3,378	3,83
Communication equipment and communication	368,48	(¹)	1,058	1,101	1,083	1,100	1,211	1,330	1,397	1,512	1,831	1,548	1,589	2,842	3,039	3,032
Other electrical equipment	361-64,369	(¹)	1,058	1,101	1,083	1,100	1,211	1,330	1,397	1,512	1,831	1,548	1,589	1,710	1,814	2,021
Motor vehicles and motor vehicles equipment	371	888	707	856	1,090	1,182	1,230	1,344	1,354	1,491	1,558	1,582	1,758	1,958	2,410	2,392
Other transportation equipment	373-75,379	2,138	2,574	2,809	4,712	5,078	5,148	5,826	5,888	5,776	5,908	5,245	4,912	4,992	5,084	5,311
Aircraft and missiles	372,19	200	249	294	284	331	403	488	542	660	734	748	744	817	911	1,008
Professional and scientific instruments	38	97	139	156	70	74	80	87	104	112	109	118	110	126	117	121
Scientific and mechanical measuring instruments	381-82	100	110	138	214	257	322	381	438	548	625	627	633	694	794	887
Optical, surgical, photographic, and other instruments	383-87	21,27,31,39	93	105	54	85	71	77	90	102	107	132	138	150	158	174
Other manufacturing industries	07-12,14-17,41-47	(¹)	(¹)	117	278	319	384	497	559	603	685	707	704	707	715	779
Nonmanufacturing industries	49-67,739,807,891															
<i>Distribution by Size of Company (based on number of employees)</i>																
Less than 1,000		389	542	532	619	632	688	821	887	(¹)	(¹)	904	984	922	926	1,004
1,000 to 4,999		550	632	642	1,022	1,035	986	1,043	1,017	(¹)	(¹)	1,233	1,185	1,205	1,230	1,342
5,000 to 9,999								793	882	980	1,033	1,096	1,170	1,087	1,151	1,255
10,000 to 24,999		5,888	6,557	7,215	10,989	11,846	12,589	13,092	13,790	14,780	15,435	14,830	15,083	2,142	2,203	2,313
25,000 or more														14,067	15,413	16,455

¹ Not separately available but included in total.² Estimated by the National Science Foundation.

Source: National Science Foundation.

^a SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1955 to 1965.^b Included in the other electrical equipment group.^c Data not tabulated at this level prior to 1972.

Table B-4.—Funds for research and development, by industry and selected company size group: 1974

Industry	SIC code	Companies with total employment of—			
		Total	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total		\$22,388	\$1,285	\$2,313	\$18,455
Food and kindred products	20	284	31	121	82
Textiles and apparel	22,23	98	6	33	11
Lumber, wood products, and furniture	24,25	67	6	(¹)	(¹)
Paper and allied products	26	219	10	82	121
Chemicals and allied products	28	2,384	414	584	1,086
Industrial chemicals	281-82	1,322	84	148	(¹)
Drugs and medicines	283	703	266	402	0
Other chemicals	284-89	338	76	67	(¹)
Petroleum refining and extraction	29,13	888	38	88	488
Rubber products	30	291	19	(¹)	214
Stone, clay, and glass products	32	188	22	39	118
Primary metals	33	318	16	44	200
Ferrous metals and products	331-32,3391,3399	183	(¹)	(¹)	115
Nonferrous metals and products	333-38,3392	153	(¹)	(¹)	86
Fabricated metal products	34	288	42	9	115
Machinery	35	2,483	146	280	1,844
Office, computing, and accounting machines	367	1,539	(¹)	(¹)	1,478
Electrical equipment and communication	36,48	5,487	253	374	4,517
Radio and TV receiving equipment	365	51	0	(¹)	(¹)
Electronic components	367	383	(¹)	(¹)	(¹)
Communication equipment & communication	368,48	3,032	100	168	2,662
Other electrical equipment	361-84,369	2,021	108	150	(¹)
Motor vehicles and motor vehicles equipment	371	2,392	34	41	2,297
Other transportation equipment	373-75,379	31	(¹)	(¹)	0
Aircraft and missiles	372,19	5,311	119	338	4,728
Professional and scientific instruments	38	1,008	78	188	(¹)
Scientific and mechanical measuring instruments	381-82	121	50	(¹)	0
Optical, surgical, photographic, and other instruments	383-87	887	28	(¹)	(¹)
Other manufacturing industries	21,27,31,38	174	14	51	15
Nonmanufacturing industries	07-12,14-17,41-47, 48-87,739,807,891	779	30	37	39

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-5.—Funds for research and development, by industry, size of company, and size of R&D program: 1974

Industry and size of company	SIC code	Total	Size of R&D program (thousands of dollars)				
			Less than \$250	\$250-999	\$1,000-999,999	\$10,000-999,999	\$100,000 or more
			(Dollars in millions)				
Total		\$22,388	\$241	\$373	\$2,208	\$6,480	\$14,088
<i>Distribution by industry</i>							
Food and kindred products	20	284	9	26	133	128	0
Textiles and apparel	22,23	98	2	15	51	0	0
Lumber, wood products, and furniture	24,25	67	9	9	(¹)	(¹)	0
Paper and allied products	26	219	4	8	78	128	0
Chemicals and allied products	28	2,384	27	28	(¹)	1,289	(¹)
Industrial chemicals	281-82	1,322	5	12	(¹)	484	(¹)
Drugs and medicines	283	703	2	4	49	848	0
Other chemicals	284-89	338	30	10	131	177	0
Petroleum refining and extraction	29,13	888	1	2	42	322	231
Rubber products	30	291	8	5	64	214	0
Stone, clay, and glass products	32	188	10	8	33	138	0
Primary metals	33	318	4	16	139	188	0
Ferrous metals and products	331-32,3391,3399	183	3	8	70	83	0
Nonferrous metals and products	333-38,3392	153	1	7	69	78	0
Fabricated metal products	34	288	34	18	82	185	0
Machinery	35	2,483	52	54	298	(¹)	(¹)
Office, computing, and accounting machines	367	1,539	3	5	31	(¹)	(¹)
Electrical equipment and communication	36,48	5,487	32	80	288	811	4,188
Radio and TV receiving equipment	365	51	1	3	(¹)	(¹)	0
Electronic components	367	383	10	11	66	(¹)	(¹)
Communication equipment & communication	368,48	3,032	5	27	87	481	2,431
Other electrical equipment	361-84,369	2,021	17	39	(¹)	202	(¹)
Motor vehicles and motor vehicles equipment	371	2,392	2	7	36	140	2,208
Other transportation equipment	373-75,379	31	4	2	25	0	0
Aircraft and missiles	372,19	5,311	7	28	88	453	4,728
Professional and scientific instruments	38	1,008	17	20	121	(¹)	(¹)
Scientific and mechanical measuring instruments	381-82	121	11	12	(¹)	(¹)	0
Optical, surgical, photographic, and other instruments	383-87	887	6	8	(¹)	(¹)	(¹)
Other manufacturing industries	21,27,31,38	174	4	17	73	79	0
Nonmanufacturing industries	07-12,14-17,41-47, 48-87,739,807,891	779	18	36	405	322	0
<i>Distribution by size of company (based on number of employees)</i>							
Less than 1,000		1,004	225	208	455	118	0
1,000 to 4,999		1,342	14	133	711	484	0
5,000 to 9,999		1,285	2	21	444	787	0
10,000 to 24,999		2,313	1	10	442	(¹)	(¹)
25,000 or more		18,466	0	1	153	(¹)	(¹)

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-8.—Federal funds for research and development, by industry and size of company: 1957-58 and 1963-74

[Dollars in millions]

Industry and size of company	SIC code	1957	1958	1959	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total		\$4,335	\$4,759	\$7,270	\$7,720	\$7,740	\$8,332	\$8,386	\$8,890	\$9,451	\$7,778	\$7,898	\$8,057	\$8,225	\$8,332
<i>Distribution by industry</i>															
Food and kindred products	20	(¹)	8	(¹)	1	1	3	2	2	1	3	2	1	1	1
Textiles and apparel	22,23	0	0	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	1	1	1	1
Lumber, wood products, and furniture	24,25	0	0	(¹)	(¹)	(¹)	0	(¹)	0	0	0	(¹)	(¹)	(¹)	(¹)
Paper and allied products	26	(¹)	0	0	0	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	2	(¹)	(¹)
Chemicals and allied products	28	59	126	234	202	191	188	210	199	182	180	184	180	206	216
Industrial chemicals	281-82	90	110	148	140	147	158	181	173	166	160	182	175	189	202
Drugs and medicines	283	(¹)	2	9	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Other chemicals	284-89	9	14	78	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Petroleum refining and extraction	29,13	11	12	21	61	48	18	18	34	10	22	17	15	14	20
Rubber products	30	37	21	46	34	22	19	22	22	27	22	19	33	36	30
Stone, clay, and glass products	32	(¹)	(¹)	3	4	3	3	2	3	1	2	3	3	2	1
Primary metals	33	8	14	10	8	8	8	8	9	10	10	6	12	11	8
Ferrous metals and products ²	331-32,3391,3399	1	2	2	2	1	3	1	1	2	1	2	3	4	4
Nonferrous metals and products	333-36,3392	4	12	8	8	7	5	6	8	9	9	4	10	7	4
Fabricated metal products	34	38	57	24	19	16	17	13	18	8	8	11	11	12	13
Machinery	35	272	343	250	246	236	296	322	337	259	239	291	348	334	359
Office, computing, and accounting machines	367	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Electrical equipment and communication	36,48	1,196	1,337	1,849	1,873	1,983	2,201	2,296	2,345	2,412	2,261	2,302	2,492	2,613	2,579
Radio and TV receiving equipment	365	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Electronic components	367														
Communication equipment & communication	368,48	518	615	1,209	1,259	1,292	1,428	1,495	1,538	1,579	1,483	1,548	1,549	1,587	1,480
Other electrical equipment	361-84,369	678	722	640	614	691	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	190	296	291	322	325	344	380	372	284	308	301	300	306	308
Other transportation equipment	373-75,379														
Aircraft and missiles	372,19	2,275	2,276	4,261	4,821	4,499	4,724	4,531	4,544	4,854	4,032	3,900	4,043	3,995	4,139
Professional and scientific instruments	38	109	137	81	95	132	145	189	234	238	204	172	173	179	184
Scientific and mechanical measuring instruments	381-82	80	93	18	20	22	22	37	35	32	29	21	24	24	20
Optical, surgical, photographic, and other instruments	383-87	29	44	65	75	110	123	152	199	206	175	151	149	155	184
Other manufacturing industries ³	21,27,31,39	74	134	3	4	4	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Nonmanufacturing industries	07-12,14-17,41-47,49-67,739,807,891	0	0	190	229	268	367	387	431	448	480	452	431	416	484
<i>Distribution by Size of Company (based on number of employees)</i>															
Less than 1,000		167	233	194	215	224	234	228	(¹)	(¹)	355	318	328	311	358
1,000 to 4,999		226	202	425	432	378	385	351	(¹)	(¹)	412	367	374	361	405
5,000 to 9,999							182	251	299	257	211	214	187	189	187
10,000 to 24,999													622	510	458
25,000 or more		3,942	4,324	6,851	7,072	7,138	7,530	7,536	7,662	7,525	8,801	8,766	6,547	6,853	6,923

¹ Estimated by the National Science Foundation.² Less than \$0.5 million.³ Not separately available but included in total.

Source: National Science Foundation.

⁴ Data not tabulated at this level prior to 1972.⁵ SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957 to 1965.⁶ Included in the other electrical equipment group.⁷ For 1957 and 1958 includes textiles & apparel; lumber, wood products, and furniture; and nonmanufacturing industries.

Table B-7.—Federal funds for research and development, by
industry and company size group: 1974

[Dollars in millions]

Industry	SIC code	Total	Companies with total employment of—		
			5,000 to 9,999	10,000 to 24,999	25,000 or more
Total		\$8,332	\$187	\$458	\$6,923
Food and kindred products	20	1	0	(¹)	(¹)
Textiles and apparel	22,23	1	(¹)	(¹)	0
Lumber, wood products, and furniture	24,25	(¹)	0	0	0
Paper and allied products	26	(¹)	0	(¹)	(¹)
Chemicals and allied products	28	216	3	13	200
Industrial chemicals	281-82	202	(¹)	(¹)	(¹)
Drugs and medicines	283	(¹)	(¹)	6	0
Other chemicals	284-99	(¹)	(¹)	(¹)	0
Petroleum refining and extraction	29,13	20	(¹)	1	(¹)
Rubber products	30	30	(¹)	0	(¹)
Stone, clay, and glass products	32	1	(¹)	(¹)	(¹)
Primary metals	33	8	(¹)	(¹)	5
Ferrous metals and products	331-32,3391,3399	4	(¹)	(¹)	(¹)
Nonferrous metals and products	333-36,3392	4	(¹)	(¹)	(¹)
Fabricated metal products	34	13	(¹)	(¹)	(¹)
Machinery	35	359	(¹)	(¹)	278
Office, computing, and accounting machines	357	(¹)	0	(¹)	269
Electrical equipment and communication	36,48	2,579	73	120	2,293
Radio and TV receiving equipment	365	(¹)	0	(¹)	0
Electronic components	367	148	(¹)	(¹)	(¹)
Communication equipment & communication	366,48	1,480	(¹)	110	1,236
Other electrical equipment	361-64,369	(¹)	(¹)	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	306	(¹)	(¹)	291
Other transportation equipment	373-75,379	5	(¹)	(¹)	0
Aircraft and missile	372,19	4,139	76	244	3,729
Professional and scientific instruments	38	184	15	4	(¹)
Scientific and mechanical measuring instruments	381-82	20	(¹)	(¹)	0
Optical, surgical, photographic, and other instruments	383-87	164	(¹)	(¹)	(¹)
Other manufacturing industries	21,27,31,39	(¹)	0	(¹)	0
Nonmanufacturing industries	07-12,14-17,41-47,49-67, 739,807,891	484	11	(¹)	(¹)

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-8.—Federal funds for research and development,
by selected industry and agency: 1963-74

(Dollars in millions)

Industry	SIC code	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total Federal													
Total .....	.....	\$7,270	\$7,720	\$7,740	\$8,332	\$8,365	\$8,560	\$8,451	\$7,779	\$7,886	8,067	8,225	8,332
Chemicals and allied products	28	234	202	191	188	210	199	192	180	184	190	205	216
Machinery	35	250	246	239	286	322	337	259	239	291	348	334	359
Electrical equipment and communication	36,48	1,849	1,873	1,983	2,201	2,298	2,345	2,412	2,281	2,302	2,492	2,613	2,579
Motor vehicles and other transportation equipment	371,373-75,379	291	322	325	344	380	372	284	308	301	304	402	311
Aircraft and missiles	372,19	4,261	4,621	4,499	4,724	4,531	4,544	4,554	4,032	3,900	4,043	3,995	4,139
Other industries .....	.....	385	465	518	604	669	769	771	759	688	682	676	728
DOD ¹													
Total .....	.....	\$4,700	\$4,192	\$3,808	\$4,241	\$5,144	\$5,427	\$5,688	\$5,321	\$5,315	5,848	6,148	5,958
Chemicals and allied products	28	(²)	104	63	53	64	64	49	35	40	40	48	39
Machinery	35	148	132	147	227	228	173	150	181	184	211	223	289
Electrical equipment and communication	36,48	1,200	1,120	1,130	1,292	1,437	1,536	1,614	1,520	1,531	1,740	1,907	1,831
Motor vehicles and other transportation equipment	371,373-75,379	(²)	194	221	229	261	271	244	274	249	237	338	267
Aircraft and missiles	372,19	2,700	2,389	2,006	2,239	2,745	2,822	3,083	2,801	2,865	3,119	3,130	3,064
Other industries .....	.....	(²)	242	262	290	419	508	538	541	446	502	502	488
NASA ¹													
Total .....	.....	\$1,800	\$2,725	\$3,166	\$3,233	\$2,300	\$2,311	\$1,868	\$1,421	\$1,391	\$1,117	\$992	\$1,105
Chemicals and allied products	28	(²)	2	1	1	2	5	5	1	3	1	1	(²)
Machinery	35	(²)	91	101	129	79	94	72	70	71	70	63	18
Electrical equipment and communication	36,48	300	264	468	497	404	431	343	281	310	244	211	194
Motor vehicles and other transportation equipment	371,373-75,379	(²)	120	98	97	87	82	33	33	48	59	45	25
Aircraft and missiles	372,19	1,400	2,084	2,340	2,291	1,595	1,554	1,298	966	911	694	615	790
Other industries .....	.....	(²)	165	163	220	138	145	119	70	48	49	57	(²)

¹ Estimates based on approximately 175 companies leading in Federal R&D funds.

² Not separately available but included in total.

Source: National Science Foundation.

Table B-9.—Company funds for research and development, by industry and size of company:
1957-58 and 1963-74¹

[Dollars in millions]

Industry and size of company	SIC code	1957	1958	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total		\$3,396	\$3,630	\$5,380	\$5,792	\$6,445	\$7,216	\$8,020	\$8,869	\$9,867	\$10,283	\$10,845	\$11,326	\$12,696	\$14,038
<i>Distribution by industry</i>															
Food and kindred products	20	74	77	(²)	143	156	161	181	185	204	232	244	259	267	293
Textiles and apparel	22,23	14	20	28	(²)	(²)	(²)	(²)	(²)	(²)	(²)	59	61	63	67
Lumber, wood products, and furniture	24,25	14	12	(²)	(²)	(²)	12	12	19	15	48	(²)	(²)	(²)	(²)
Paper and allied products	26	35	42	69	77	93	(²)	123	(²)	(²)	(²)	(²)	188	(²)	(²)
Chemicals and allied products	28	616	666	1,004	1,062	1,165	1,219	1,297	1,389	1,467	1,586	1,635	1,705	1,857	2,148
Industrial chemicals	281-82	423	443	662	725	761	780	785	812	847	880	858	867	946	1,121
Drugs and medicines	283	104	126	207	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Other chemicals	284-89	89	97	135	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Petroleum refining and extraction	29,13	200	234	298	332	349	353	355	403	457	493	498	454	485	578
Rubber products	30	70	68	111	124	140	149	160	183	190	198	211	232	245	261
Stone, clay, and glass products	32	(²)	(²)	97	105	109	114	134	139	158	165	162	182	173	187
Primary metals	33	103	117	174	186	205	224	234	241	247	265	266	248	265	308
Ferrous metals and products ⁴	331-32,3391,3399	83	78	105	114	127	136	134	134	135	148	142	136	143	159
Nonferrous metals and products	333-36,3392	40	39	69	72	78	88	100	106	112	117	124	113	123	149
Fabricated metal products	34	97	105	129	129	129	137	151	165	174	194	222	231	262	274
Machinery	35	397	438	709	769	826	931	1,004	1,140	1,277	1,410	1,482	1,614	1,857	2,134
Office, computing, and accounting machines	367	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Electrical equipment and communication	36,48	608	632	1,017	1,099	1,217	1,426	1,571	1,780	1,969	2,091	2,232	2,424	2,606	2,908
Radio and TV receiving equipment	365	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Electronic components	367												190	227	236
Communication equipment & communication	366,48	230	253	564	613	697	821	930	1,000	1,134	1,253	1,334	1,292	1,452	1,552
Other electrical equipment	361-64,369	378	379	453	496	520	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Motor vehicles and motor vehicles equipment	371	517	560	799	860	905	1,000	994	1,119	1,274	1,274	1,455	1,659	2,012	2,086
Other transportation equipment	373-75,379												21	22	26
Aircraft and missiles	372,19	299	333	462	467	649	802	1,138	1,232	1,355	1,213	1,012	948	1,089	1,171
Professional and scientific instruments	38	140	157	202	236	271	323	353	426	496	541	572	646	732	824
Scientific and mechanical measuring instruments	381-82	59	63	53	54	58	65	67	77	77	89	89	100	93	101
Optical, surgical, photographic, and other instruments	383-87	81	94	149	182	213	258	286	349	419	452	483	545	639	723
Other manufacturing industries	21,27,31,39	19	39	52	61	67	(²)	88	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	(²)	55	85	90	116	130	172	172	207	225	252	277	299	315
<i>Distribution by size of company (based on number of employees)</i>															
Less than 1,000		374	299	425	417	435	387	459	(²)	(²)	549	565	595	614	646
1,000 to 4,999		² 406	² 440	596	602	579	657	666	(²)	(²)	821	828	831	869	938
5,000 to 9,999							611	642	661	775	884	956	879	961	1,067
10,000 to 24,999		² 2,615	² 2,891	4,338	4,773	5,431	6,561	8,254	7,118	7,909	8,029	8,297	1,521	1,692	1,854
25,000 or more													7,500	8,559	9,532

¹ See table 1, footnote 1.

² Estimated by the National Science Foundation.

³ Not separately available but included in total.

Source: National Science Foundation.

⁴ SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1967-1968.

⁵ Included in the other electrical equipment group.

⁶ Data not tabulated at this level prior to 1972.

Table B-10.—Company funds for research and development,
by industry and selected company size group: 1974

[Dollars in millions]

Industry	SIC code	Companies with total employment of—			
		Total	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total .....	.....	\$14,038	\$1,067	\$1,854	\$9,532
Food and kindred products	20	293	31	(¹)	(¹)
Textiles and apparel	22,23	1	(¹)	(¹)	11
Lumber, wood products, and furniture	24,25	(¹)	6	(¹)	(¹)
Paper and allied products	26	(¹)	10	(¹)	(¹)
Chemicals and allied products	28	2,148	412	571	868
Industrial chemicals	281-82	1,121	(¹)	(¹)	(¹)
Drugs and medicines	283	(¹)	(¹)	366	0
Other chemicals	284-89	(¹)	(¹)	(¹)	(¹)
Petroleum refining and extraction	29,13	578	(¹)	65	(¹)
Rubber products	30	261	(¹)	(¹)	(¹)
Stone, clay, and glass products	32	187	(¹)	(¹)	(¹)
Primary metals	33	308	(¹)	(¹)	195
Ferrous metals and products	331-32,3391,3399	159	(¹)	(¹)	(¹)
Nonferrous metals and products	333-36,3392	149	(¹)	(¹)	(¹)
Fabricated metal products	34	274	(¹)	(¹)	(¹)
Machinery	35	2,134	(¹)	(¹)	1,566
Office, computing, and accounting machines	357	(¹)	(¹)	(¹)	1,207
Electrical equipment and communication	36,48	2,908	180	254	2,225
Radio and TV receiving equipment	365	(¹)	0	(¹)	(¹)
Electronic components	367	236	(¹)	(¹)	(¹)
Communication equipment & communication	366,48	1,552	(¹)	56	1,392
Other electrical equipment	361-64,369	(¹)	(¹)	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	2,086	(¹)	(¹)	2,007
Other transportation equipment	373-75,379	26	(¹)	(¹)	0
Aircraft and missiles	372,19	1,171	42	92	1,000
Professional and scientific instruments	38	824	61	162	(¹)
Scientific and mechanical measuring instruments	381-82	101	(¹)	(¹)	0
Optical, surgical, photographic, and other instruments	383-87	723	(¹)	(¹)	(¹)
Other manufacturing industries	21,27,31,39	(¹)	14	(¹)	15
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	315	19	(¹)	(¹)

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-11.—Company-financed research and development contracted to outside organizations,
by industry and selected company size group: 1973 and 1974

[Dollars in millions]

Industry and size of company	SIC code	1973	1974
Total .....	.....	\$258	\$284
<i>Distribution by industry</i>			
Food and kindred products	20	12	11
Textiles and apparel	22,23	1	1
Lumber, wood products, and furniture	24,25	2	3
Paper and allied products	26	8	6
Chemicals and allied products	28	66	78
Industrial chemicals	281-82	11	20
Drugs and medicines	283	44	46
Other chemicals	284-89	11	13
Petroleum refining and extraction	29,13	21	34
Rubber products	30	3	2
Stone, clay, and glass products	32	1	1
Primary metals	33	8	10
Ferrous metals and products	331-32,3391,3399	6	6
Nonferrous metals and products	333-36,3392	2	4
Fabricated metal products	34	4	4
Machinery	35	20	17
Office, computing, and accounting machines	357	4	3
Electrical equipment and communication	36,48	8	7
Radio and TV receiving equipment	365	(¹)	(¹)
Electronic components	367	(¹)	(¹)
Communication equipment & communication	366,48	(¹)	(¹)
Other electrical equipment	361-64,369	5	4
Motor vehicles and motor vehicles equipment	371	40	42
Other transportation equipment	373-75,379	(¹)	(¹)
Aircraft and missiles	372,19	5	4
Professional and scientific instruments	38	12	13
Scientific and mechanical measuring instruments	381-82	(¹)	(¹)
Optical, surgical, photographic, and other instruments	383-87	(¹)	(¹)
Other manufacturing industries	21,27,31,39	3	4
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	45	47
<i>Distribution by size of company (based on number of employees)</i>			
5,000 to 9,999 .....	.....	44	47
10,000 to 24,999 .....	.....	68	68
25,000 or more .....	.....	105	120

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-12.—Companies with 1,000 or more employees¹ contracting research and development to outside organizations, by industry and size of company: 1974

Industry	SIC code	Companies with total employment of—									
		1,000 or more		1,000 to 4,999		5,000 to 9,999		10,000 to 24,999		25,000 or more	
		Total	Contracting outside	Total	Contracting outside	Total	Contracting outside	Total	Contracting outside	Total	Contracting outside
Total		1,162	389	643	155	210	86	183	87	12	62
Food and kindred products	20	101	42	53	19	19	9	18	10	11	4
Textiles and apparel	22,23	62	12	31	3	11	3	16	5	4	1
Lumber, wood products, and furniture	24,25	32	7	23	3	4	2	2	1	3	1
Paper and allied products	26	48	20	19	4	10	6	10	6	9	4
Chemicals and allied products	28	102	55	47	24	28	15	17	10	10	6
Industrial chemicals	281-82	38	18	14	7	9	3	6	3	9	5
Drugs and medicines	283	26	17	10	5	9	7	7	5	0	0
Other chemicals	284-89	38	20	23	12	10	5	4	2	1	1
Petroleum refining and extraction	29,13	25	18	5	2	5	3	6	5	9	8
Rubber products	30	38	6	28	1	4	2	2	2	4	1
Stone, clay, and glass products	32	34	14	17	5	7	3	6	4	4	2
Primary metals	33	74	23	38	9	12	2	12	5	12	7
Ferrous metals and products	331-32,3391,3399	49	13	24	7	10	2	7	1	8	3
Nonferrous metals and products	333-36,3392	25	10	14	2	2	0	5	4	4	4
Fabricated metal products	34	68	23	45	14	13	6	5	0	5	4
Machinery	35	155	42	93	16	32	12	18	11	12	3
Office, computing, and accounting machines	357	17	6	7	1	2	2	2	1	6	2
Electrical equipment and communication	36,48	134	33	82	17	18	5	19	5	15	6
Radio and TV receiving equipment	365	7	0	5	0	0	0	1	0	1	0
Electronic components	367	27	5	17	3	5	1	3	1	2	0
Communication equipment & communication	366,48	32	7	14	2	3	0	5	0	10	5
Other electrical equipment	361-64,369	68	21	46	12	10	4	10	4	2	1
Motor vehicles and motor vehicles equipment	371	32	10	13	3	6	1	7	2	6	4
Other transportation equipment	373-75,379	16	1	10	1	1	0	5	0	0	0
Aircraft and missiles	372,19	47	13	18	1	8	2	8	3	13	7
Professional and scientific instruments	38	57	15	34	7	11	6	9	1	3	1
Scientific and mechanical measuring instruments	381-82	26	6	17	2	8	4	1	0	0	0
Optical, surgical, photographic, and other instruments	383-87	31	9	17	5	3	2	8	1	3	1
Other manufacturing industries	21,27,31,39	73	27	51	14	9	4	11	7	2	2
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	64	28	36	12	12	5	12	10	4	1

¹ Data not available for companies with less than 1,000 employees.

Source: National Science Foundation.

Table B-13.—R&D-performing companies in manufacturing and nonmanufacturing industries, by size of company: 1974

Size of company (based on number of employees)	Number of companies		
	Total	Manufacturing industries	Nonmanufacturing industries
Total	11,162	(¹)	(¹)
Less than 1,000	² 10,000	(¹)	(¹)
1,000 to 4,999	643	607	36
5,000 to 9,999	210	198	12
10,000 to 24,999	183	171	12
25,000 or more	126	122	4

¹ Not separately available but included in total.

² This estimate represents the midpoint of a range from 6,000 to 14,000

Source: National Science Foundation

Table B-14.—R&D-performing companies with 1,000 or more employees,¹ by size of company and R&D program: 1974

Size of company (based on number of employees)	Total	Size of R&D program (thousands of dollars)				
		Less than \$200	\$200—\$999	\$1,000—\$9,999	\$10,000—99,999	\$100,000 or more
Total	1,162	171	298	480	177	36
1,000 to 4,999	643	147	240	237	19	0
5,000 to 9,999	210	18	37	119	36	0
10,000 to 24,999	183	5	19	95	63	1
25,000 or more	126	1	2	29	59	35

¹ Data not available for companies with less than 1,000 employees.

Source: National Science Foundation.

Table 15.—R&D-performing manufacturing companies with 5,000 or more employees,¹
by industry and percent change in R&D funds: 1973-74

Industry	SIC code	Total number of companies	10 percent or more increase	10 percent or more decrease	Less than 10 percent change
Total		491	224	51	216
Food and kindred products	20	48	20	4	24
Textiles and apparel	22,23	31	12	3	16
Lumber, wood products, and furniture	24,25	9	4	2	3
Paper and allied products	26	29	12	4	13
Chemicals and allied products	28	55	39	2	14
Industrial chemicals	281-82	24	18	—	6
Drugs and medicines	283	16	13	—	3
Other chemicals	284-89	15	8	2	5
Petroleum refining and extraction	29,13	20	16	1	3
Rubber products	30	10	4	1	5
Stone, clay, and glass products	32	17	6	2	9
Primary metals	33	36	17	1	18
Ferrous metals and products	331-32,3391,3399	25	10	—	15
Nonferrous metals and products	333-36,3392	11	7	1	3
Fabricated metal products	34	23	10	1	12
Machinery	35	62	26	6	30
Office, computing, and accounting machines	357	10	6	2	2
Electrical equipment and communication	36,48	52	18	8	26
Radio and TV receiving equipment	365	2	1	—	1
Electronic components	367	10	3	2	5
Communication equipment & communication	366,48	18	3	5	10
Other electrical equipment	361-64,369	22	11	1	10
Motor vehicles and motor vehicles equipment	371	19	4	3	12
Other transportation equipment	373-75,379	6	3	1	2
Aircraft and missiles	372,19	29	11	10	8
Professional and scientific instruments	38	23	12	1	10
Scientific and mechanical measuring instruments	381-82	9	3	1	5
Optical, surgical, photographic, and other instruments	383-87	14	9	—	5
Other manufacturing industries	21,27,31,39	22	10	1	11

¹ Manufacturing companies with 5,000 or more employees are classified into those increasing 10 percent or more, those decreasing 10 percent or more or those changing less than 10 percent based on their ratio of change for total R&D funds between 1973 and 1974.

Source: National Science Foundation.

Table B-16.—Percent of total, Federal, and company funds of R&D-performing companies ranked by size of R&D program: 1972-74

Companies ranked by size of R&D program (based on total R&D funds) ¹	1972	1973	1974
Percent of total R&D funds			
First 4	18	19	19
Next 4	16	15	14
Next 12	21	22	20
Next 20	12	11	11
Next 60	13	13	14
Next 100	7	8	8
Next 200	6	6	6
Percent of Federal R&D funds			
First 4	10	10	18
Next 4	32	31	21
Next 12	29	30	32
Next 20	16	15	11
Next 60	7	7	11
Next 100	2	3	2
Next 200	3	3	3
Percent of company R&D funds			
First 4	24	25	20
Next 4	5	5	11
Next 12	15	15	12
Next 20	9	9	11
Next 60	17	17	16
Next 100	11	11	11
Next 200	8	8	8

¹ Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

Source: National Science Foundation.

Table B-17.—Percent of net sales and employment of R&D-performing companies ranked by size of R&D program: 1972-74

Companies ranked by size of R&D program (based on total R&D funds) ¹	1972	1973	1974
Percent of net sales			
First 4	10	9	6
Next 4	3	3	5
Next 12	6	6	5
Next 20	7	7	12
Next 60	16	17	14
Next 100	14	14	16
Next 200	15	16	16
Percent of employment			
First 4	9	8	7
Next 4	4	4	5
Next 12	7	7	7
Next 20	8	8	8
Next 60	12	12	12
Next 100	12	12	13
Next 200	16	16	16

¹ Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

Source: National Science Foundation.

Table B-18.—Percent of total and Federal R&D funds and of net sales of R&D-performing companies ranked by size of R&D program,¹ by industry: 1974

Industry	SIC code	Percent of total R&D funds			Percent of Federal R&D funds			Percent of net sales of all R&D-performing companies		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total		19	14	20	18	21	32	6	5	5
Food and kindred products	20	28	15	25	26	0	1	8	13	28
Textiles and apparel	22,23	35	18	24	3	0	18	21	13	22
Lumber, wood products, and furniture	24,25	54	12	16	74	0	26	42	12	27
Paper and allied products	26	59	13	18	80	2	18	23	12	38
Chemicals and allied products	28	33	14	22	77	16	6	23	6	18
Industrial chemicals	281-82	59	18	15	83	17	1	42	13	28
Drugs and medicines	283	43	22	31	31	36	29	30	27	36
Other chemicals	284-89	45	13	18	99	0	1	49	10	10
Petroleum refining and extraction	29,13	57	23	18	85	3	12	48	21	27
Rubber products	30	74	8	12	68	0	31	65	11	11
Stone, clay, and glass products	32	67	16	9	19	23	0	37	22	25
Primary metals	33	36	16	24	33	32	7	32	17	21
Ferrous metals and products	331-32,3391,3399	56	15	21	49	7	33	50	13	20
Nonferrous metals and products	333-35,3392	56	20	20	81	7	9	47	15	32
Fabricated metal products	34	39	11	14	68	2	22	28	4	18
Machinery	35	43	12	14	84	0	9	21	8	16
Office computing and accounting machines	357	91	7	2	98	0	2	73	20	5
Electrical equipment and communication	36,48	55	18	15	60	18	17	34	17	17
Radio and TV receiving equipment	365	92	5	3	100	0	0	86	6	8
Electronic components	367	86	14	14	95	2	2	41	24	18
Communication equipment & communication	368,48	64	20	14	62	18	19	44	36	14
Other electrical equipment	361-84,369	87	3	4	98	0	1	56	6	18
Motor vehicles and motor vehicles equipment	371	94	4	2	95	4	1	82	6	10
Other transportation equipment	373-75,379	53	26	12	81	18	0	39	35	17
Aircraft and missiles	372,19	54	27	16	55	27	15	31	22	32
Professional and scientific instruments	38	66	10	12	81	11	3	34	14	28
Scientific and mechanical measuring instruments	381-82	34	17	27	71	8	19	18	26	24
Optical, surgical, photographic, and other instruments	383-87	75	12	10	91	4	4	45	19	27
Other manufacturing industries	21,27,31,39	40	17	25	86	0	3	20	17	31
Nonmanufacturing industries	07-12,14-17,41-47, 49-87,739,807,891	30	13	41	35	14	44	7	7	20

¹ All rankings are based on total R&D funds.

Source: National Science Foundation.

Table B-19.—R&D-performing companies with 1,000 or more employees¹ and number with Federal R&D funds, by industry and size of company: 1974

Industry	SIC code	Companies with total employment of—									
		1,000 or more		1,000 to 4,999		5,000 to 9,999		10,000 to 24,999		25,000 or more	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Total		1,162	243	643	71	210	43	183	59	126	70
Food and kindred products	20	101	3	53	1	19	0	18	1	11	1
Textiles and apparel	22,23	62	4	31	2	11	1	16	1	4	0
Lumber, wood products, and furniture	24,25	32	1	23	1	4	0	2	0	3	0
Paper and allied products	26	48	3	19	0	10	0	10	1	9	2
Chemicals and allied products	28	102	24	47	1	28	5	17	11	10	7
Industrial chemicals	281-82	38	11	14	1	9	1	6	2	9	7
Drugs and medicines	283	26	9	10	0	9	3	7	6	0	0
Other chemicals	284-89	38	4	23	0	10	1	4	3	1	0
Petroleum refining and extraction	29,13	25	12	5	0	5	1	6	4	9	7
Rubber, products	30	38	6	28	1	4	1	2	0	4	4
Stone, clay, and glass products	32	34	5	17	0	7	2	6	1	4	2
Primary metals	33	74	14	38	4	12	3	12	3	12	4
Ferrous metals and products	331-32,3391,3399	49	6	24	1	10	2	7	2	8	1
Nonferrous metals and products	333-36,3392	25	8	14	3	2	1	5	1	4	3
Fabricated metal products	34	68	12	45	3	13	3	5	3	5	3
Machinery	35	155	25	93	9	32	4	18	5	12	7
Office, computing, and accounting machines	357	17	6	7	1	2	0	2	1	6	4
Electrical equipment and communication	36,48	134	46	82	14	18	7	19	12	15	13
Radio and TV receiving equipment	365	7	1	5	0	0	0	1	1	1	0
Electronic components	367	27	11	17	3	5	3	3	3	2	2
Communication equipment & communication	386,48	32	21	14	6	3	3	5	3	10	9
Other electrical equipment	361-64,369	68	13	46	5	10	1	10	5	2	2
Motor vehicles and motor vehicles equipment	371	32	9	13	2	6	1	7	2	6	4
Other transportation equipment	373-75,379	16	2	10	0	1	1	5	1	0	0
Aircraft and missiles	372,19	47	37	18	10	8	8	8	6	13	13
Professional and scientific instruments	38	57	19	34	8	11	4	9	5	3	2
Scientific and mechanical measuring instruments	381-82	26	7	17	3	8	3	1	1	0	0
Optical, surgical, photographic, and other instruments	383-87	31	12	17	5	3	1	8	4	3	2
Other manufacturing industries	21,27,31,39	73	4	51	2	9	0	11	2	2	0
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	64	17	36	13	12	2	12	1	4	1

¹ Data not available for companies with less than 1,000 employees.

Source: National Science Foundation.

Table B-20.—Geographic distribution of funds for industrial research and development: 1963-74

	[Dollars in millions]											
Area	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
UNITED STATES, TOTAL	\$12,630	\$13,512	\$14,185	\$15,548	\$16,385	\$17,429	\$18,308	\$18,062	\$18,311	\$19,383	\$20,921	\$22,369
NORTHEAST	3,818	4,105	4,385	5,092	5,438	5,867	6,095	6,333	6,510	6,805	6,845	7,347
New England	993	1,072	1,175	1,494	1,661	1,870	1,835	1,854	1,884	1,929	2,036	2,150
Maine	4	5	6	5	8	9	6	10	9	10	8	9
New Hampshire	6	7	8	27	49	43	49	49	52	(1)	(1)	(1)
Vermont	6	7	11	15	14	20	32	34	61	(1)	(1)	(1)
Massachusetts	481	526	616	826	915	986	977	1,004	1,082	1,141	1,158	1,153
Rhode Island	7	9	9	9	14	17	45	52	51	43	45	43
Connecticut	489	518	526	612	663	795	726	705	629	637	732	834
Mid Atlantic	2,825	3,034	3,210	3,598	3,777	3,997	4,260	4,479	4,626	4,876	4,809	5,196
New York	1,176	1,334	1,429	1,573	1,718	1,830	1,981	2,038	2,066	2,163	1,999	2,170
New Jersey	958	959	1,005	1,119	1,098	1,117	1,202	1,292	1,403	1,532	1,436	1,506
Pennsylvania	691	741	777	906	911	1,050	1,077	1,149	1,157	1,181	1,375	1,520
NORTH CENTRAL	2,791	2,877	2,978	3,382	3,638	3,766	4,216	4,388	4,840	5,376	5,637	5,905
East North Central	2,230	2,312	2,500	2,857	3,157	3,291	3,570	3,622	3,833	4,308	4,587	4,867
Ohio	583	588	648	774	879	910	925	982	945	984	1,085	1,111
Indiana	236	243	278	316	377	386	431	428	448	459	390	404
Illinois	398	417	448	539	612	625	680	729	792	849	908	996
Michigan	862	908	962	1,049	1,089	1,162	1,305	1,259	1,413	1,733	1,934	2,068
Wisconsin	149	155	164	179	201	208	229	224	235	283	270	289
West North Central	562	565	478	525	480	475	646	766	1,007	1,068	1,049	1,038
Minnesota	149	180	186	225	239	250	298	286	289	325	350	411
Iowa	58	76	73	103	75	71	87	138	138	136	160	177
Missouri	304	287	193	156	125	99	211	(1)	(1)	544	475	381
North Dakota	0	0	0	0	0	0	(1)	(1)	(1)	(1)	(1)	(1)
South Dakota	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Nebraska	(1)	2	(1)	(1)	(1)	(1)	(1)	(1)	(1)	11	9	12
Kansas	47	18	20	30	34	45	41	50	36	49	50	51
SOUTH	1,701	2,076	2,227	2,437	2,414	2,531	2,488	2,341	2,472	2,450	2,695	3,037
South Atlantic	931	925	1,015	1,179	1,220	1,304	1,466	1,424	1,612	1,546	1,685	1,855
Delaware	26	26	36	41	37	26	34	51	(1)	(1)	(1)	(1)
Maryland	241	267	276	275	254	310	301	361	369	386	432	491
District of Columbia	12	14	18	19	23	47	30	31	21	24	10	18
Virginia	93	93	123	(1)	(1)	(1)	(1)	(1)	133	131	196	240
West Virginia	89	71	53	59	63	61	54	48	40	(1)	(1)	(1)
North Carolina	71	71	81	124	120	138	157	175	140	143	205	213
South Carolina	28	31	32	47	48	51	59	65	(1)	58	38	41
Georgia	61	71	75	(1)	(1)	(1)	(1)	(1)	122	91	75	80
Florida	284	273	323	338	375	436	424	371	422	353	388	370
East South Central	280	305	416	487	473	416	364	346	342	327	373	408
Kentucky	22	35	36	41	48	51	53	55	52	61	88	88
Tennessee	139	136	158	206	221	199	194	183	191	181	191	221
Alabama	116	132	221	238	203	164	114	105	96	81	85	90
Mississippi	2	2	1	2	2	2	3	3	3	4	8	9
West South Central	491	846	796	771	721	811	658	571	519	577	637	774
Arkansas	2	2	1	5	5	6	5	7	5	5	4	6
Louisiana	131	282	255	237	154	127	103	38	51	66	66	86
Oklahoma	53	93	121	99	83	71	73	81	63	82	102	114
Texas	304	469	419	430	479	607	477	445	400	424	465	568
WEST	4,320	4,453	4,594	4,635	4,897	5,264	5,519	5,000	4,489	4,752	5,295	5,646
Mountain	465	473	457	446	489	596	651	687	570	576	633	710
Montana	(1)	(1)	(1)	(1)	(1)	(1)	0	0	(1)	(1)	(1)	(1)
Idaho	27	29	28	(1)	(1)	(1)	(1)	(1)	30	(1)	(1)	(1)
Wyoming	1	1	(1)	2	2	2	3	3	5	(1)	(1)	(1)
Colorado	126	109	105	108	119	139	149	217	140	130	149	170
New Mexico	(1)	185	168	146	154	151	179	179	(1)	163	149	177
Arizona	86	97	110	116	125	180	197	152	155	171	214	211
Utah	71	29	22	18	21	21	25	22	17	26	44	62
Nevada	(1)	(1)	21	38	52	55	37	37	(1)	(1)	(1)	(1)
Pacific	3,854	3,981	4,137	4,189	4,407	4,668	4,868	4,313	3,919	4,176	4,662	4,936
Washington	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Oregon	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	38	38	43	52
California	3,512	3,754	3,768	(1)	(1)	(1)	(1)	(1)	3,468	3,643	4,244	4,403
Alaska	0	0	0	0	0	0	(1)	(1)	(1)	(1)	(1)	(1)
Hawaii	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	3	2	2	2
Undistributed funds	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	449	435

* Not separately available but included in total.

* For 1963-72, these funds were allocated to individual States based on each State's share of total R&D.

Source: National Science Foundation.

Table B-21.—Geographic distribution of funds for industrial research and development, by source of funds: 1974

(Dollars in millions)			
Area	Total	Federal	Company
UNITED STATES, TOTAL	\$22,369	\$8,332	\$14,038
NORTHEAST	7,347	2,529	4,816
New England	2,150	1,012	1,139
Maine	9	0	9
New Hampshire	(¹)	(¹)	(¹)
Vermont	(¹)	(¹)	(¹)
Massachusetts	1,153	669	484
Rhode Island	43	(¹)	(¹)
Connecticut	836	278	558
Middle Atlantic	5,196	1,517	3,677
New York	2,170	613	1,557
New Jersey	1,506	405	1,099
Pennsylvania	1,520	499	1,021
NORTH CENTRAL	5,905	820	5,085
East North Central	4,867	444	4,423
Ohio	1,111	270	841
Indiana	404	77	327
Illinois	996	(¹)	(¹)
Michigan	2,068	78	1,990
Wisconsin	289	(¹)	(¹)
West North Central	1,038	377	661
Minnesota	411	114	297
Iowa	177	6	171
Missouri	381	(¹)	(¹)
North Dakota	(¹)	(¹)	(¹)
South Dakota	(¹)	0	(¹)
Nebraska	12	(¹)	(¹)
Kansas	51	(¹)	(¹)
SOUTH	3,037	1,140	1,896
South Atlantic	1,855	866	1,190
Delaware	(¹)	(¹)	(¹)
Maryland	491	236	256
District of Columbia	18	(¹)	(¹)
Virginia	240	125	115
West Virginia	(¹)	(¹)	(¹)
North Carolina	213	19	194
South Carolina	41	0	41
Georgia	80	30	50
Florida	370	247	123
East South Central	408	218	189
Kentucky	88	(¹)	(¹)
Tennessee	221	(¹)	(¹)
Alabama	90	(¹)	(¹)
Mississippi	9	0	9
West South Central	774	256	517
Arkansas	6	0	6
Louisiana	86	(¹)	(¹)
Oklahoma	114	(¹)	(¹)
Texas	568	213	355
WEST	5,646	3,688	1,959
Mountain	710	326	384
Montana	(¹)	0	(¹)
Idaho	(¹)	0	(¹)
Wyoming	(¹)	0	(¹)
Colorado	170	17	153
New Mexico	177	174	3
Arizona	211	83	128
Utah	62	(¹)	(¹)
Nevada	(¹)	(¹)	(¹)
Pacific	4,936	3,361	1,574
Washington	(¹)	(¹)	(¹)
Oregon	52	(¹)	(¹)
California	4,403	3,075	1,327
Alaska	(¹)	0	(¹)
Hawaii	2	(¹)	(¹)
Undistributed funds	436	155	280

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-22.—Distribution of R&D costs, by industry and type of cost: 1974

[Dollars in millions]

Industry	SIC code	Coverage ratio ¹	R&D costs	Wages		Materials and supplies	Other R&D costs
				Scientists and engineers	Supporting personnel		
Total		.93	\$22,369	\$6,932	\$4,139	\$4,080	\$7,216
Food and kindred products	20	.94	294	118	58	42	76
Textiles and apparel	22,23	.84	68	26	14	10	18
Lumber, wood products, and furniture ..	24,25	.64	67	39	7	17	4
Paper and allied products	26	.62	219	85	42	32	60
Chemicals and allied products	28	.96	2,364	843	447	373	700
Industrial chemicals	281-82	.98	1,322	433	275	248	366
Drugs and medicines	283	.99	703	281	107	70	245
Other chemicals	284-89	.82	338	129	65	55	89
Petroleum refining and extraction	29,13	1.00	598	179	95	74	249
Rubber products	30	.90	291	96	51	50	94
Stone, clay, and glass products	32	.82	189	66	41	34	48
Primary metals	33	.90	316	103	70	51	92
Ferrous metals and products	331-32,3391,3399	.83	163	56	39	31	37
Nonferrous metals and products	333-36,3392	.97	153	47	31	20	55
Fabricated metal products	34	.70	288	112	58	47	71
Machinery	35	.95	2,493	820	549	329	795
Office, computing, and accounting machines	357	.99	1,539	485	332	148	574
Electrical equipment and communication	36,48	.93	5,487	1,664	988	1,128	1,707
Radio and TV receiving equipment	365	.05	51	(²)	(²)	(²)	(²)
Electronic components	367	.63	383	139	69	61	114
Communication equipment & communication	366,48	.96	3,032	858	506	522	1,146
Other electrical equipment	361-64,369	.98	2,021	636	408	540	437
Motor vehicles and motor vehicles equipment	371	1.00	2,392	619	739	440	594
Other transportation equipment	373-75,379	.77	31	10	5	4	12
Aircraft and missiles	372,19	.95	5,311	1,499	563	1,148	2,101
Professional and scientific instruments ..	38	.69	1,008	348	255	152	253
Scientific and mechanical measuring instruments	381-82	.86	121	44	26	16	35
Optical, surgical, photographic, and other instruments	383-87	.67	887	304	229	136	218
Other manufacturing industries	21,27,31,39	.88	174	64	41	23	46
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	.90	779	241	116	126	296

¹ The coverage ratio is derived by dividing R&D funds for which a distribution by type of cost was reported by total R&D funds, including those for which a distribution was not reported.

² Data withheld because of high imputation rate.

Source: National Science Foundation.

Table B-23.—Distribution of R&D costs, by industry and type of cost: 1973

[Dollar in millions]

Industry	SIC code	Coverage ratio ¹	R&D costs	Wages		Materials and supplies	Other R&D costs
				Scientists and engineers	Supporting personnel		
Total		.85	\$20,921	\$6,317	\$4,080	\$3,864	\$6,663
Food and kindred products	20	.86	268	105	53	37	73
Textiles and apparel	22,23	.66	64	24	14	11	15
Lumber, wood products, and furniture ..	24,25	.48	55	33	7	13	4
Paper and allied products	26	.59	194	71	38	29	56
Chemicals and allied products	28	.85	2,062	725	405	340	592
Industrial chemicals	281-82	.88	1,135	375	245	213	302
Drugs and medicines	283	.85	616	233	99	68	216
Other chemicals	284-89	.77	312	117	61	59	75
Petroleum refining and extraction	29,13	.93	498	152	93	69	184
Rubber products	30	.77	280	91	52	50	87
Stone, clay, and glass products	32	.72	175	60	38	34	43
Primary metals	33	.77	276	87	62	47	81
Ferrous metals and products	331-32,3391,3399	.65	147	47	34	31	35
Nonferrous metals and products	333-36,3392	.90	130	40	28	16	46
Fabricated metal products	34	.56	273	103	59	47	64
Machinery	35	.90	2,191	722	469	260	740
Office, computing, and accounting machines	357	.98	1,319	430	263	104	522
Electrical equipment and communication	36,48	.90	5,280	1,613	969	1,059	1,639
Radio and TV receiving equipment	365	.06	49	(²)	(²)	(²)	(²)
Electronic components	367	.64	378	138	71	62	107
Communication equipment & communication	366,48	.90	3,039	893	520	500	1,126
Other electrical equipment	361-64,369	.97	1,814	558	370	492	394
Motor vehicles and motor vehicles equipment	371	.98	2,410	539	788	474	609
Other transportation equipment	373-75,379	.74	27	7	4	4	12
Aircraft and missiles	372,19	.81	5,084	1,415	642	1,078	1,949
Professional and scientific instruments ..	38	.64	911	303	233	153	222
Scientific and mechanical measuring instruments	381-82	.79	117	42	24	17	34
Optical, surgical, photographic, and other instruments	383-87	.62	794	261	209	136	188
Other manufacturing industries	21,27,31,39	.84	158	57	38	23	40
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	.71	715	210	116	136	253

¹ The coverage ratio is derived by dividing R&D funds for which a distribution by type of cost was reported by total R&D funds, including those for which a distribution was not reported.

² Data withheld because of high imputation rate.

Source: National Science Foundation.

Table B-24.—Full-time-equivalent number of R&D scientists and engineers, by industry
and size of company: 1957-58 and 1963-74

(In thousands)

Industry and size of company	SIC code	January														
		1957	1958	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Total		229.4	243.8	327.3	340.2	343.6	353.2	367.2	376.7	387.1	384.1	366.8	349.9	356.6	358.2	357.5
<i>Distribution by industry</i>																
Food and kindred products	20	3.8	4.8	5.1	5.7	6.2	6.2	6.1	6.3	6.3	6.3	6.7	6.6	6.7	6.6	7.0
Textiles and apparel	22,23	.7	.8	1.0	1.2	1.2	1.4	1.9	2.5	2.6	2.9	1.8	1.8	1.9	1.8	1.9
Lumber, wood products, and furniture	24,25	.8	.8	.5	.5	.5	.6	.5	.5	.9	1.0	1.7	1.7	1.6	1.7	2.0
Paper and allied products	26	1.5	1.7	2.5	3.8	3.8	4.3	4.7	4.8	4.8	4.9	5.0	4.9	4.9	4.9	5.3
Chemicals and allied products	28	29.4	31.0	38.3	35.8	37.9	38.0	36.9	38.9	40.3	40.2	42.8	40.9	40.7	41.6	43.4
Industrial chemicals	281-82	18.0	18.8	22.9	22.2	24.3	23.3	21.7	22.3	22.6	21.9	22.4	19.7	19.8	19.8	20.8
Drugs and medicines	283	4.7	5.1	6.9	6.9	7.2	7.5	8.7	9.8	10.1	11.4	11.6	11.8	11.2	12.6	13.0
Other chemicals	284-89	6.7	7.1	8.5	6.7	6.4	7.2	6.5	6.8	7.6	6.9	8.8	9.5	9.7	9.8	9.6
Petroleum refining and extraction	29,13	6.9	7.4	8.9	8.1	8.7	8.9	8.7	9.2	10.0	9.9	9.2	8.3	8.2	8.2	8.4
Rubber products	30	4.7	4.7	5.8	6.0	5.8	5.7	5.8	6.1	6.3	6.8	5.9	5.8	5.8	5.7	5.9
Stone, clay, and glass products	32	(¹)	(¹)	3.8	3.3	3.5	3.1	3.3	4.1	4.2	4.6	4.1	3.9	3.9	4.1	4.3
Primary metals	33	5.1	5.2	5.2	5.1	5.5	5.5	5.9	5.9	6.2	6.3	6.3	6.0	5.5	5.7	5.9
Ferrous metals and products ²	331-32,3391,3399	2.9	3.0	2.9	2.8	3.2	3.2	3.3	3.1	3.2	3.2	3.4	3.4	3.1	3.2	3.3
Nonferrous metals and products	333-36,3392	2.2	2.2	2.3	2.3	2.3	2.3	2.5	2.7	3.0	3.1	2.9	2.6	2.4	2.5	2.6
Fabricated metal products	34	8.4	8.3	6.8	7.0	6.6	6.3	6.3	5.6	6.6	5.9	6.9	6.4	6.5	6.9	7.1
Machinery	35	24.9	27.4	31.4	27.3	29.4	30.5	33.6	37.4	39.4	41.4	40.5	41.1	41.7	43.2	44.9
Office, computing, and accounting machines	357	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	24.7	25.7	26.6
Electrical equipment and communication	36,48	42.9	47.9	85.8	89.5	87.8	92.0	98.6	98.4	101.6	102.4	95.2	87.7	92.6	93.6	91.4
Radio and TV receiving equipment	365	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	.9	1.0	1.2	1.9	2.4	2.1	1.4	1.3	1.2
Electronic components	367													9.1	9.3	8.2
Communication equipment & communication	366,48	19.2	22.3	55.1	60.4	58.8	62.3	66.7	67.4	67.4	66.3	63.6	57.2	52.4	52.7	50.8
Other electrical equipment	361-64,369	23.7	25.6	30.7	29.1	29.0	29.7	31.0	30.0	33.0	34.2	29.2	28.4	29.7	30.3	31.2
Motor vehicles and motor vehicles equipment	371	13.6	15.0	21.1	23.3	24.1	24.8	25.2	24.3	25.0	25.1	27.8	29.3	28.3	27.6	26.1
Other transportation equipment	373-75,379													.9	.8	.9
Aircraft and missiles	372,19	58.7	58.6	90.7	101.1	99.2	99.3	100.4	101.1	99.9	92.6	78.3	71.2	72.3	70.8	66.8
Professional and scientific instruments	38	10.2	11.0	9.4	10.8	11.5	12.5	13.0	14.1	15.1	14.8	15.1	15.1	15.9	16.6	16.9
Scientific and mechanical measuring instruments	381-82	5.8	6.5	3.9	3.8	3.6	3.8	3.6	3.8	3.9	3.7	4.2	4.1	4.3	4.1	4.0
Optical, surgical, photographic, and other instruments	383-87	4.4	4.5	5.5	7.0	7.9	8.7	9.4	10.3	11.2	11.1	10.9	10.9	11.6	12.5	12.9
Other manufacturing industries	21,27,31,39	17.8	19.2	2.8	2.0	2.4	2.3	2.2	2.4	2.8	2.7	3.9	3.7	3.9	4.0	4.1
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891			8.2	9.8	9.6	11.7	14.1	15.1	15.1	16.3	15.6	15.7	15.3	14.4	15.2
<i>Distribution by size of company (based on number of employees)</i>																
Less than 1,000		44.8	48.8	34.1	32.5	32.4	30.0	27.4	27.2	(⁵)	(⁵)	28.2	28.4	26.9	27.9	29.3
1,000 to 4,999		22.4	24.0	35.0	34.5	32.1	30.1	30.5	29.9	(⁵)	(⁵)	31.8	30.9	28.8	28.8	29.8
5,000 to 9,999								24.0	24.6	24.6	28.5	28.7	28.4	27.0	26.3	26.4
10,000 to 24,999		162.2	171.0	258.2	273.2	279.1	293.1	285.3	295.0	307.3	299.1	278.1	262.4	45.0	45.8	46.3
25,000 or more														226.9	229.4	225.7

¹ Data included in the other manufacturing industries group.

² SIC codes 3391 and 3399 included in the nonferrous metals and products group for January 1957 to January 1966.

³ Data not tabulated at this level prior to 1973.

⁴ Included in the other electrical equipment group.

⁵ Not separately available but included in total.

Source: National Science Foundation.

Table B-25.—Man-years of R&D scientists and engineers, by industry,
size of company, and size of R&D program: 1974

Industry and size of company	SIC code	Total	Size of R&D program (thousands of dollars)				
			Less than \$200	\$200— \$999	\$1,000— \$9,999	\$10,000— \$99,999	\$100,000 or more
Total		356,900	14,900	10,200	49,300	98,400	184,100
<i>Distribution by industry</i>							
Food and kindred products	20	6,800	200	600	3,400	2,600	0
Textiles and apparel	22,23	1,800	100	400	300	0	0
Lumber, wood products, and furniture	24,25	1,900	400	200	(¹)	(¹)	0
Paper and allied products	26	5,100	200	300	1,700	2,900	0
Chemicals and allied products	28	42,400	2,300	800	(¹)	22,800	(¹)
Industrial chemicals	281-82	20,300	500	(¹)	(¹)	7,100	(¹)
Drugs and medicines	283	12,500	200	(¹)	(¹)	10,900	0
Other chemicals	284-89	9,600	1,600	400	2,800	4,800	0
Petroleum refining and extraction	29,13	8,300	(¹)	(¹)	900	4,900	(¹)
Rubber products	30	5,800	300	200	1,500	3,800	0
Stone, clay, and glass products	32	4,200	600	200	800	2,600	0
Primary metals	33	5,700	400	400	2,500	2,500	0
Ferrous metals and products	331-32,3391,3399	3,200	(¹)	200	(¹)	1,300	0
Nonferrous metals and products	333-36,3392	2,600	(¹)	200	(¹)	1,200	0
Fabricated metal products	34	7,000	1,900	500	2,000	2,600	0
Machinery	35	44,000	2,400	1,300	6,700	(¹)	(¹)
Office, computing, and accounting machines	357	26,200	100	(¹)	1,100	(¹)	(¹)
Electrical equipment and communication	36,48	92,400	2,300	2,300	7,000	18,100	62,700
Radio and TV receiving equipment	365	1,200	100	100	(¹)	(¹)	0
Electronic components	367	8,700	700	300	2,000	(¹)	(¹)
Communication equipment & communication	366,48	51,900	700	800	1,900	9,600	38,900
Other electrical equipment	361-64,359	30,600	800	1,100	(¹)	4,300	(¹)
Motor vehicles and motor vehicles equipment	371	26,800	100	200	800	2,000	23,700
Other transportation equipment	373-75,379	800	300	(¹)	(¹)	0	0
Aircraft and missiles	372,19	68,800	300	500	2,100	8,900	57,000
Professional and scientific instruments	33	16,600	900	700	3,800	(¹)	(¹)
Scientific and mechanical measuring instruments	381-82	4,000	500	500	(¹)	(¹)	0
Optical, surgical, photographic, and other instruments	383-87	12,600	400	200	(¹)	(¹)	(¹)
Other manufacturing industries	21,27,31,39	3,700	200	300	1,600	1,600	0
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	14,800	2,000	1,300	6,300	5,200	0
<i>Distribution by size of company (based on number of employees)</i>							
Less than 1,000		28,400	13,800	5,400	8,100	1,100	0
1,000 to 4,999		28,900	800	4,100	16,600	7,400	0
5,000 to 9,999		26,600	100	500	9,800	16,200	0
10,000 to 24,999		45,400	(¹)	(¹)	10,900	(¹)	(¹)
25,000 or more		227,600	(¹)	(¹)	3,900	(¹)	(¹)

¹ Not separately available but included in total.

Source: National Science Foundation

Table B-26.—Full-time-equivalent number of R&D scientists and engineers,
by industry and source of R&D funds: January 1974 and January 1975

Industry	SIC code	January 1975			January 1974		
		Total	Federal	Company	Total	Federal	Company
Total		357,500	108,300	249,400	358,200	108,600	249,700
Food and kindred products	20	7,000	(¹)	(¹)	6,600	(¹)	(¹)
Textiles and apparel	22,23	1,900	(¹)	(¹)	1,800	(¹)	(¹)
Lumber, wood products, and furniture	24,25	2,000	0	2,000	1,700	0	1,700
Paper and allied products	26	5,300	(¹)	(¹)	4,900	(¹)	(¹)
Chemicals and allied products	28	43,400	2,700	40,700	41,600	2,400	39,200
Industrial chemicals	281-82	20,800	2,100	18,700	19,800	1,900	17,900
Drugs and medicines	283	13,000	(¹)	(¹)	12,000	(¹)	(¹)
Other chemicals	284-89	9,600	(¹)	(¹)	9,800	(¹)	(¹)
Petroleum refining and extraction	29,13	8,400	200	8,200	8,200	300	7,900
Rubber products	30	5,900	500	5,400	5,700	500	5,200
Stone, clay, and glass products	32	4,300	(¹)	(¹)	4,100	(¹)	(¹)
Primary metals	33	5,900	100	5,800	5,700	200	5,500
Ferrous metals and products	331-32,3391,3399	3,300	(¹)	3,300	3,200	100	3,100
Nonferrous metals and products	333-36,3392	2,600	100	2,500	2,500	100	2,400
Fabricated metal products	34	7,100	400	6,700	6,900	300	6,600
Machinery	35	44,900	6,400	38,500	43,200	6,400	36,800
Office, computing, and accounting machines	357	26,600	(¹)	(¹)	25,700	(¹)	(¹)
Electrical equipment and communication	36,48	91,400	37,600	53,800	93,600	37,800	55,800
Radio and TV receiving equipment	365	1,200	(¹)	(¹)	1,300	(¹)	(¹)
Electronic components	367	8,200	3,300	4,900	9,300	3,300	6,000
Communication equipment & communication ..	366,48	50,800	22,800	28,000	52,700	23,200	29,500
Other electrical equipment	361-64,369	31,200	(¹)	(¹)	30,300	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	26,100	3,500	22,600	27,600	3,600	24,000
Other transportation equipment	373-75,379	900	200	700	800	100	700
Aircraft and missiles	372,19	66,800	45,500	21,300	70,800	47,600	23,200
Professional and scientific instruments	38	16,900	2,100	14,800	16,600	2,500	14,100
Scientific and mechanical measuring instruments	381-82	4,000	600	3,400	4,100	900	3,200
Optical, surgical, photographic, and other instruments	383-87	12,900	1,500	11,400	12,500	1,600	10,900
Other manufacturing industries	21,27,31,39	4,100	(¹)	(¹)	4,000	(¹)	(¹)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	15,200	8,900	6,300	14,400	6,800	7,600

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-27.—Federally supported R&D scientists and engineers, by selected industry and agency: 1963-74¹

Industry	SIC code	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total Federal													
Total		163,500	163,800	162,700	162,500	156,200	157,300	154,200	140,400	115,800	113,500	112,400	107,800
Chemicals and allied products	28	(²)	5,100	4,100	3,700	3,900	3,800	3,300	3,400	3,100	2,800	2,800	2,700
Machinery	35	(²)	6,600	6,000	7,400	8,100	8,400	8,500	6,800	5,500	5,800	6,200	6,300
Electrical equipment and communication	36,48	49,300	49,600	50,300	52,700	51,100	51,600	52,500	47,500	36,400	38,700	37,700	36,500
Motor vehicles and other transportation equipment	371,373-75,379	(²)	(²)	(²)	6,900	6,500	6,400	5,700	5,100	5,000	4,100	4,900	3,500
Aircraft and missiles	372,19	80,800	83,700	82,200	80,700	74,400	74,000	70,800	64,400	54,000	52,000	49,300	46,700
Other industries		(²)	(²)	(²)	11,100	12,200	12,900	13,400	13,200	10,800	10,100	11,500	12,100
DOD ³													
Total		111,800	97,100	88,500	89,000	98,400	103,200	104,400	94,600	82,100	82,400	84,200	80,500
Chemicals and allied products	28	(²)	2,600	1,700	1,200	1,200	1,400	1,000	1,100	900	700	800	700
Machinery	35	(²)	4,500	4,200	4,500	5,600	5,500	5,700	4,200	3,700	3,700	4,100	5,000
Electrical equipment and communication	36,48	34,800	30,900	29,800	27,300	31,600	34,700	35,600	33,300	25,200	27,600	28,100	27,500
Motor vehicles and other transportation equipment	371,373-75,379	(²)	(²)	(²)	4,200	4,200	4,100	4,400	3,700	4,300	2,900	3,900	2,900
Aircraft and missiles	372,19	55,100	48,700	41,500	45,300	48,800	50,000	49,700	43,900	41,200	40,700	38,600	35,200
Other industries		(²)	(²)	(²)	6,100	7,600	8,100	8,700	8,400	6,800	6,800	8,700	9,300
NASA ³													
Total		35,800	49,300	56,800	55,200	40,900	38,700	33,500	29,100	18,500	15,500	13,400	12,400
Chemicals and allied products	28	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Machinery	35	(²)	2,300	2,500	3,000	2,200	2,700	2,500	2,000	900	1,100	1,000	800
Electrical equipment and communication	36,48	6,400	8,200	11,300	15,100	11,200	9,700	9,300	7,300	4,700	4,000	3,400	2,800
Motor vehicles and other transportation equipment	371,373-75,379	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Aircraft and missiles	372,19	22,100	31,400	35,800	31,400	22,900	21,700	17,900	16,600	10,500	8,600	7,300	7,400
Other industries		(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)

¹ For 1963-70, the number of R&D scientists and engineers was derived by using the arithmetic mean of the full-time equivalent number of R&D scientists and engineering employed in the Januarys of two consecutive years; for 1971-74, man-years were used.

² Not separately available but included in total.

³ Estimates based on approximately 200 companies leading in Federal R&D funds.

Source: National Science Foundation.

Table B-28.—Man-years and cost of R&D scientists and engineers,
by source of funds and Federal agency: 1974

Industry	SIC code	Total	Company	Federal			
				Total	DOD	NASA	All other agencies
Man-years of R&D scientists and engineers							
Total		356,900	249,100	107,800	80,500	12,400	14,800
Chemicals and allied products	28	42,400	39,700	2,700	700	(¹)	(¹)
Machinery	35	44,000	37,700	6,300	5,000	800	500
Electrical equipment and communication	36,48	92,400	55,900	36,500	27,500	2,800	6,200
Motor vehicles and other transportation equipment	371,373-75,379	27,600	24,100	3,500	2,900	(¹)	(¹)
Aircraft and missiles	372,19	68,800	22,100	46,700	35,200	7,400	4,100
Other industries		81,700	69,600	12,100	9,300	(¹)	(¹)
Cost per R&D scientist or engineer							
Total		\$62,700	\$56,400	\$77,300	\$74,000	\$89,100	\$85,800
Chemicals and allied products	28	55,700	54,100	80,100	55,700	(¹)	(¹)
Machinery	35	56,700	56,600	57,000	57,800	60,000	44,800
Electrical equipment and communication	36,48	59,300	52,000	70,700	66,600	69,300	89,300
Motor vehicles and other transportation equipment	371,373-75,379	87,800	87,600	88,900	92,100	(¹)	(¹)
Aircraft and missiles	372,19	77,200	53,500	88,600	87,000	106,800	69,800
Other industries		52,500	51,200	60,200	50,300	(¹)	(¹)

¹ Data withheld because of high imputation rate.

² Not separately available but included in total.

Source: National Science Foundation.

Table B-29.—R&D scientists and engineers per 1,000 employees, by industry and size of company:
1958 and 1963-74¹

Industry and size of company	SIC code	1958	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total		21	28	30	30	27	27	26	26	26	26	25	25	25
<i>Distribution by industry</i>														
Food and kindred products	20	6	7	7	7	7	7	7	6	7	7	7	7	7
Textiles and apparel	22,23	1	3	3	3	3	3	4	5	4	3	3	3	3
Lumber, wood products, and furniture	24,25	5	4	5	5	4	4	4	5	6	7	7	6	6
Paper and allied products	26	6	6	6	6	6	6	6	6	8	8	8	8	8
Chemicals and allied products	28	39	40	41	39	38	36	36	37	39	40	39	38	39
Industrial chemicals	281-82	42	40	40	38	35	33	33	33	35	34	34	33	33
Drugs and medicines	283	46	47	54	53	53	51	51	57	73	73	66	64	65
Other chemicals	284-89	30	38	33	32	35	33	33	32	29	33	33	32	32
Petroleum refining and extraction	29,13	15	17	16	17	17	18	18	19	17	16	16	16	16
Rubber products	30	19	20	19	18	17	17	17	18	17	16	16	15	16
Stone, clay, and glass products	32	(²)	12	12	12	13	14	14	14	12	12	11	11	12
Primary metals	33	5	5	5	5	5	5	5	6	6	6	6	5	6
Ferrous metals and products ³	331-32,3391,3399	4	4	4	4	4	4	4	4	4	4	4	4	4
Nonferrous metals and products	333-36,3392	6	8	8	8	8	8	8	9	9	9	8	9	9
Fabricated metal products	34	16	15	16	15	13	14	11	11	9	10	9	9	10
Machinery	35	22	28	28	27	27	28	27	28	27	28	28	27	28
Office, computing, and accounting machines	357	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	58	57	60
Electrical equipment and communication	36,48	43	55	55	53	44	43	45	42	41	40	39	40	40
Radio and TV receiving equipment	365	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	18	22	32	33	35	27	20	18
Electronic components	367											34	35	32
Communication equipment & communication	366,48	52	67	69	66	53	52	51	46	45	43	46	47	46
Other electrical equipment	361-64,369	37	41	40	39	38	35	40	37	36	34	34	35	36
Motor vehicles and motor vehicles equipment	371	16	19	20	20	20	20	19	19	20	22	23	22	22
Other transportation equipment	373-75,379											10	8	8
Aircraft and missiles	372,19	72	99	110	113	95	89	80	76	73	74	75	66	64
Professional and scientific instruments	38	44	36	37	36	33	32	34	30	29	33	33	34	34
Scientific and mechanical measuring instruments	381-82	57	38	35	33	28	26	27	24	26	31	30	29	29
Optical, surgical, photographic, and other instruments	383-87	33	35	38	39	36	35	37	33	30	34	35	36	36
Other manufacturing industries	21,27,31,39	(²)	9	8	8	7	6	6	8	8	8	8	8	9
Nonmanufacturing industries	07,12,14,17,41-47, 49,67,739,807,891	(²)	9	11	10	12	13	12	13	28	28	28	27	26
<i>Distribution by Size of Company (based on number of employees)</i>														
Less than 1,000		18	27	27	27	28	28	28	(²)	26	29	28	26	28
1,000 to 4,999		12	19	19	18	16	16	16	(²)	18	18	19	17	18
5,000 to 9,999							15	16	19	19	18	19	18	18
10,000 to 24,999		25	31	32	31	30	31	30	28	29	28	16	16	16
25,000 or more												31	31	31

¹ The number of R&D scientists and engineers for 1974 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1974 and January 1975 by the number of company employees in all activities in March 1974. Similar procedures were used in earlier years.
² Not separately available but included in total.

Source: National Science Foundation.

³ SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1958.

⁴ Data not tabulated at this level prior to 1972.

⁵ Included in the other electrical equipment group for 1958-66.

Table B-30.—Cost per R&D scientist or engineer, by industry and size of company:
1957-58 and 1963-74¹

Industry and size of company	SIC code	1957	1958	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total		\$32,700	\$32,800	\$37,800	\$39,500	\$40,700	\$43,200	\$44,100	\$45,600	\$47,500	\$48,100	\$51,100	\$54,900	\$58,200	\$62,500
<i>Distribution by industry</i>															
Food and kindred products	20	17,200	16,800	25,200	24,200	25,300	26,700	29,500	29,700	32,500	36,200	36,800	38,800	39,900	43,300
Textiles and apparel	22,23	20,000	28,900	26,400	26,700	29,200	30,900	25,900	22,700	25,500	24,700	32,800	32,100	34,900	36,900
Lumber, wood products, and furniture	24,25	17,500	13,300	22,000	24,000	20,000	21,800	24,000	27,100	15,800	35,600	28,200	30,000	32,800	36,000
Paper and allied products	26	21,900	22,700	27,000	20,300	23,200	26,000	26,900	30,000	38,800	36,000	37,800	38,600	38,900	43,100
Chemicals and allied products	28	23,300	24,600	32,600	34,800	35,700	37,600	39,800	40,100	41,200	42,600	43,500	46,500	49,200	55,600
Industrial chemicals	281-82	27,400	28,400	34,800	37,200	38,200	40,800	43,900	43,900	45,500	47,000	48,500	52,600	56,300	65,200
Drugs and medicines	283	21,200	23,300	30,200	33,200	36,300	38,000	37,100	39,500	40,400	40,300	43,600	47,600	51,300	56,100
Other chemicals	284-89	14,200	15,300	27,900	28,200	26,600	26,400	29,800	29,200	29,200	33,400	31,600	31,900	31,900	34,900
Petroleum refining and extraction	29,13	29,500	32,600	35,400	46,800	45,100	42,200	41,500	45,500	46,900	53,900	57,700	57,100	60,400	72,000
Rubber products	30	22,800	18,700	26,500	26,800	28,200	29,200	30,600	33,100	33,100	34,600	39,300	45,500	49,100	50,200
Stone, clay, and glass products	32	(²)	(²)	26,000	32,100	33,900	36,600	36,800	34,200	36,100	36,100	38,800	42,300	42,200	44,800
Primary metals	33	21,000	24,000	35,700	36,800	38,700	40,700	41,000	41,500	41,100	43,700	44,200	46,600	48,600	54,300
Ferrous metals and products ⁴	331-32,3391,3399	21,700	24,600	37,400	38,700	40,000	(³)	42,200	42,900	42,500	45,200	42,400	41,800	45,700	50,100
Nonferrous metals and products	333-36,3392	20,000	23,200	33,500	34,300	37,000	(³)	41,200	40,400	39,700	42,000	46,500	48,800	52,300	59,500
Fabricated metal products	34	16,200	18,800	22,200	21,800	22,500	24,400	27,400	30,000	29,100	31,300	35,000	37,100	39,700	41,100
Machinery	35	25,600	27,500	31,000	35,800	35,600	38,000	37,400	38,500	38,000	40,300	43,500	47,300	50,700	56,600
Office, computing, and accounting machines	367	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	49,200	51,200	58,800
Electrical equipment and communication	36,48	39,700	38,200	33,000	33,500	35,600	38,000	39,300	41,100	43,100	44,000	49,600	54,500	56,100	59,400
Radio and TV receiving equipment	365	(⁶)	(⁶)	(⁶)	(⁶)	(⁶)	(⁷)	47,400	50,000	36,800	32,600	28,400	26,700	37,500	41,000
Electronic components	367	36,000	34,600	31,700	31,400	32,800	34,900	36,200	37,700	40,600	42,100	47,700	34,800	40,800	43,900
Communication equipment & communication	366,48												54,200	57,000	58,600
Other electrical equipment	361-64,369	42,800	41,900	35,400	37,900	41,300	(³)	45,800	48,000	48,500	48,800	55,200	58,600	60,000	65,700
Motor vehicles and motor vehicles equipment	371	49,400	53,800	49,400	49,900	50,300	53,800	54,700	60,500	62,200	59,800	61,500	69,200	87,200	89,200
Other transportation equipment	373-75,379												27,800	34,700	37,400
Aircraft and missiles	372,19	43,900	41,900	49,600	50,700	51,900	55,300	56,300	57,500	61,400	61,400	65,700	69,500	72,000	77,200
Professional and scientific instruments	38	23,500	25,600	29,900	29,700	33,600	36,700	40,000	45,200	49,100	49,800	49,300	52,700	54,400	60,200
Scientific and mechanical measuring instruments	381-82	22,600	23,100	18,400	20,000	21,600	23,500	28,100	29,100	28,700	29,900	26,500	29,500	27,500	29,700
Optical, surgical, photographic and other instruments	383-87	24,700	29,100	37,500	34,500	38,900	42,100	44,500	51,000	56,100	57,000	58,100	61,400	63,500	69,900
Other manufacturing industries	21,27,31,39	(³)	(³)	23,700	29,500	30,200	34,200	39,100	39,200	38,900	40,000	35,800	39,500	39,400	42,700
Nonmanufacturing industries	07-12,14-17, 41-47,49-67, 739,807,891	(³)	(³)	31,000	32,900	36,100	38,500	38,300	39,900	41,700	44,200	45,000	45,600	49,300	52,600
<i>Distribution by Size of Company (based on number of employees)</i>															
Less than 1,000		11,600	12,000	18,600	19,500	21,100	21,600	25,200	26,500	(³)	(³)	31,200	32,100	32,500	35,100
1,000 to 4,999		27,200	25,100	29,400	31,100	30,700	34,400	33,700	35,500	(³)	(³)	38,100	40,300	43,100	45,900
5,000 to 9,999								36,700	39,000	38,900	38,300	41,000	38,500	42,100	47,600
10,000 to 24,999		39,400	38,700	41,400	42,900	43,900	46,100	45,800	49,100	50,900	51,400	55,700	48,100	48,000	50,300
25,000 or more													53,600	67,300	72,300

¹ The number of R&D scientists and engineers is derived by using the arithmetic mean of the full-time equivalent of R&D scientists and engineers employed in the Januarys of two consecutive years.

² Included in the other manufacturing group.

³ Not separately available but included in total.

⁴ Sic codes 3391 and 3399 included in the nonferrous metals and products group for 1957-1966.

⁵ Data not tabulated at this level prior to 1972.

⁶ Included in the other electrical equipment group.

⁷ Estimated by the National Science Foundation.

Table B-31.—Cost per R&D scientist or engineer, by industry and selected company size group: 1974¹

Industry	SIC code	Total	Companies with total employment of—		
			5,000 to 9,999	10,000 to 24,999	25,000 or more
Total .....	.....	\$62,500	\$47,600	\$50,300	\$72,300
Food and kindred products	20	43,300	50,700	40,800	45,300
Textiles and apparel	22,23	36,900	48,100	36,100	35,800
Lumber, wood products, and furniture	24,25	36,000	56,300	(²)	(²)
Paper and allied products	26	43,100	38,300	54,100	40,200
Chemicals and allied products	28	55,600	50,100	53,700	75,100
Industrial chemicals	281-82	65,200	52,400	50,700	(²)
Drugs and medicine	283	56,100	57,200	65,200	0
Other chemicals	284-89	34,900	34,000	36,100	(²)
Petroleum refining and extraction	29-13	72,000	55,300	57,800	77,900
Rubber products	30	50,200	47,300	(²)	55,200
Stone, clay, and glass products	32	44,800	42,500	42,400	52,500
Primary metals	33	54,300	62,400	45,400	60,700
Ferrous metals and products	331-32,3391,3399	50,100	(²)	(²)	61,600
Nonferrous metals and products	333-36,3392	59,500	(²)	(²)	59,600
Fabricated metal products	34	41,100	32,300	44,300	52,700
Machinery	35	56,600	55,000	49,400	63,500
Office, computing, and accounting machines	357	58,800	(²)	(²)	60,500
Electrical equipment and communication	36,48	59,400	52,000	51,700	64,600
Radio and TV receiving equipment	365	41,000	0	(²)	(²)
Electronic components	367	43,900	(²)	(²)	(²)
Communication equipment & communication	366,48	58,600	48,800	59,700	60,100
Other electrical equipment	361-64,369	65,700	52,500	42,100	(²)
Motor vehicles and motor vehicles equipment	371	89,200	44,300	46,500	92,200
Other transportation equipment	373-75,379	37,400	(²)	(²)	0
Aircraft and missiles	372,19	77,200	38,000	55,900	82,400
Professional and scientific instruments	38	60,200	37,800	44,000	(²)
Scientific and mechanical measuring instruments	381-82	29,700	39,400	(²)	0
Optical, surgical, photographic, and other instruments	383-87	69,900	35,000	(²)	(²)
Other manufacturing industries	21,27,31,39	42,700	34,400	48,600	33,900
Nonmanufacturing industries	07-12,14-17, 41-47,49-67, 739,807,892	52,600	71,200	50,300	43,200

¹ The number of R&D scientists and engineers is derived by using the arithmetic mean of the full-time equivalent of R&D scientists and engineers employed in the Januarys of two consecutive years.
Not separately available but included in total.

Source: National Science Foundation.

Table B-32.—Cost per R&D scientist or engineer in companies ranked by size of R&D program: 1972-74¹

Companies ranked by size of R&D program (based on total R&D funds)	1972	1973	1974
First 4	\$64,500	\$68,500	\$79,100
Next 4	76,300	81,700	81,800
Next 12	63,100	73,200	78,800
Next 20	57,500	60,400	67,300
Next 60	51,000	52,700	57,000
Next 100	41,800	45,400	48,800
Next 200	39,700	43,600	45,700
Average, all R&D-performing companies	54,900	58,300	62,500
Other R&D-performing companies	28,300	20,100	21,400

¹ The number of R&D scientists and engineers is derived by using the arithmetic mean of the full-time equivalent of R&D scientists and engineers employed in the Januarys of two consecutive years.

Table B-33.—Total employment of R&D-performing companies, by industry
and selected company size group: 1973 and 1974

[In thousands]

Industry	SIC code	1973				1974			
		Total	Companies with total employment of—			Total	Companies with total employment of—		
			5,000 to 9,999	10,000 to 24,999	25,000 or more		5,000 to 9,999	10,000 to 24,999	25,000 or more
Total		14,462	1,479	2,893	7,353	14,386	1,499	2,934	7,255
Food and kindred products	20	967	121	290	384	976	121	296	390
Textiles and apparel	22,23	626	71	275	187	618	71	276	182
Lumber, wood products, and furniture	24,25	258	27	(¹)	109	262	27	(¹)	111
Paper and allied products	26	647	73	149	351	647	73	147	352
Chemicals and allied products	28	1,083	189	257	420	1,106	198	271	435
Industrial chemicals	281-82	593	63	85	(¹)	612	67	87	(¹)
Drugs and medicines	283	182	59	97	0	198	63	108	0
Other chemicals	284-89	308	66	75	(¹)	296	67	77	(¹)
Petroleum refining and extraction	29,13	509	46	112	336	514	45	117	336
Rubber products	30	376	31	(¹)	204	374	30	(¹)	205
Stone, clay, and glass products	32	357	55	98	130	357	56	94	131
Primary metals	33	1,060	83	197	642	1,078	83	193	664
Ferrous metals and products	331-32,3391,3399	777	(¹)	116	502	791	(¹)	116	517
Nonferrous metals and products	333-36,3392	282	(¹)	81	140	287	(¹)	78	148
Fabricated metal products	34	711	96	72	171	710	100	76	177
Machinery	35	1,570	212	276	679	1,577	220	286	666
Office, computing, and accounting machines	357	438	(¹)	(¹)	373	437	(¹)	(¹)	372
Electrical equipment and communication	36,48	2,316	135	330	1,525	2,297	135	330	1,512
Radio and TV receiving equipment	365	66	0	(¹)	(¹)	64	0	(¹)	(¹)
Electronic components	367	266	43	38	100	258	39	42	96
Communication equipment & communication	366,48	1,119	22	89	952	1,112	21	86	951
Other electrical equipment	361-64,369	864	70	(¹)	(¹)	863	75	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	1,278	46	113	1,070	1,168	45	114	961
Other transportation equipment	373-75,379	107	(¹)	64	0	110	(¹)	69	0
Aircraft and missiles	372,19	1,081	49	134	784	1,049	51	128	764
Professional and scientific instruments	38	483	84	122	152	496	85	129	160
Scientific and mechanical measuring instruments	381-82	144	59	(¹)	0	140	60	(¹)	0
Optical, surgical, and other instruments	383-87	339	25	(¹)	152	357	26	(¹)	160
Other manufacturing industries	21,27,31,39	474	62	190	(¹)	471	59	192	(¹)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	557	89	154	152	576	93	154	153

¹ Not separately available but included in total.

Table B-34.—Total and company R&D funds per employee,
by size of company: 1963-74¹

Size of company (based on number of employees)	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total R&D funds per employee												
Total	\$1,110	\$1,170	\$1,170	\$1,160	\$1,180	\$1,210	\$1,220	\$1,250	\$1,300	\$1,380	\$1,432	\$1,556
Less than 1,000	520	560	550	620	660	(²)	(²)	840	920	890	850	969
1,000 to 4,999	580	610	570	550	570	(²)	(²)	700	690	750	746	808
5,000 to 9,999				540	560	690	670	720	750	730	778	837
10,000 to 24,999	1,310	1,360	1,360	1,450	1,470	1,450	1,450	1,470	1,540	770	769	797
25,000 or more										1,950	2,088	2,258
Company R&D funds per employee												
Total	\$470	\$500	\$530	\$540	\$580	\$610	\$660	\$710	\$760	\$800	\$869	\$976
Less than 1,000	360	370	370	390	420	(²)	(²)	510	590	570	564	624
1,000 to 4,999	340	350	350	340	370	(²)	(²)	470	480	520	527	564
5,000 to 9,999				410	420	470	500	580	620	600	650	712
10,000 to 24,999	520	550	590	620	660	690	740	800	850	550	591	639
25,000 or more										1,040	1,159	1,308

¹ Averages were derived by dividing total and company R&D funds for a calendar year by employment figures for March of that year.

² Not separately available but included in total.

Source: National Science Foundation.

Table B-35.—Net sales of R&D-performing manufacturing companies, by industry
and selected company size group: 1973 and 1974

[Dollars in millions]

Industry	SIC code	1973				1974			
		Total	Companies with total employment of—			Total	Companies with total employment of—		
			5,000 to 9,999	10,000 to 24,999	25,000 or more		5,000 to 9,999	10,000 to 24,999	25,000 or more
Total .....	.....	\$625,171	\$63,906	\$123,575	\$343,475	\$747,183	\$76,598	\$149,912	\$412,769
Food and kindred products	20	64,988	10,047	19,546	20,899	77,453	12,062	23,156	24,796
Textiles and apparel	22,23	15,311	1,753	6,634	4,515	16,353	1,869	7,124	4,905
Lumber, wood products, and furniture	24,25	8,960	852	(¹)	3,929	10,080	969	(¹)	4,421
Paper and allied products	26	27,608	2,788	6,402	15,553	32,025	3,345	7,685	17,715
Chemicals and allied products	28	59,798	10,876	13,613	24,115	75,417	13,388	18,474	30,748
Industrial chemicals	281-82	31,870	3,506	3,796	(¹)	40,890	4,616	5,007	(¹)
Drugs and medicines	283	8,485	3,128	4,200	0	9,668	3,463	4,931	0
Other chemicals	284-89	19,443	4,242	5,618	(¹)	24,859	5,308	8,536	(¹)
Petroleum refining and extraction	29,13	74,516	6,372	13,510	53,614	126,007	10,055	19,110	95,444
Rubber products	30	15,249	1,097	(¹)	9,986	16,962	1,142	(¹)	11,022
Stone, clay, and glass products	32	11,696	1,745	3,360	4,453	12,766	1,837	3,660	5,004
Primary metals	33	46,552	3,416	9,738	28,053	58,455	4,186	12,009	36,223
Ferrous metals and products	331-32,3399	30,882	2,454	4,344	21,096	39,410	3,154	5,646	27,366
Nonferrous metals and products	333-62,3392	15,670	962	5,394	6,957	19,045	1,032	6,364	8,859
Fabricated metal products	34	22,905	3,371	2,553	6,644	25,386	3,857	3,112	7,895
Machinery	35	54,661	7,473	8,427	24,073	63,480	8,494	11,758	27,551
Office, computing, and accounting machines	357	13,814	(¹)	(¹)	12,160	15,496	(¹)	(¹)	13,695
Electrical equipment and communication	36,48	73,366	4,419	11,627	48,017	79,827	4,800	12,731	52,291
Radio and TV receiving equipment	365	2,944	0	(¹)	(¹)	2,994	0	(¹)	(¹)
Electronic components	367	6,854	1,414	1,266	(¹)	7,894	1,494	1,576	(¹)
Communication equipment & communication	366,348	34,509	586	2,705	29,639	36,560	582	2,753	31,657
Other electrical equipment	361-64,369	29,061	2,419	(¹)	(¹)	32,379	2,724	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	69,087	2,127	4,860	60,598	65,308	2,388	5,307	56,080
Other transportation equipment	373-75,379	4,921	(¹)	3,206	0	5,459	(¹)	3,777	0
Aircraft and missiles	372,19	39,471	1,804	5,353	29,496	42,445	1,996	5,497	32,015
Professional and scientific instruments	38	16,469	3,018	4,192	5,786	18,524	3,403	4,698	6,710
Scientific and mechanical measuring instruments	381-82	3,922	1,706	(¹)	0	4,293	1,911	(¹)	0
Optical, surgical, photographic, and other instruments	383-87	12,547	1,312	(¹)	5,786	14,231	1,492	(¹)	6,710
Other manufacturing industries	21,27,31,39	19,613	2,590	8,325	3,744	21,236	2,681	9,204	3,949

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-36.—R&D funds as percent of net sales in R&D-performing manufacturing companies,
by industry and size of company: 1957-58 and 1963-74

Industry and size of company	SIC codes	1957	1958	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total		3.4	3.8	4.5	4.6	4.3	4.2	4.2	4.0	4.0	3.7	3.5	3.4	3.3	2.9
<i>Distribution by industry</i>															
Food and kindred products	20	.3	.3	.4	.4	.4	.4	.5	.5	.4	.5	.5	.4	.4	.4
Textiles and apparel	22,23	(¹)	.3	.5	.5	.5	.5	.5	.5	.6	.5	.5	.4	.4	.4
Lumber, wood products, and furniture	24,25	(¹)	.4	.5	.5	.4	.4	.3	.4	.4	.8	.7	.7	.6	.8
Paper and allied products	26	.6	.7	.8	.8	.8	.9	.9	.9	1.0	.9	.9	.8	.7	.7
Chemicals and allied products	28	3.5	3.8	4.3	4.5	4.3	4.4	4.6	4.2	4.2	3.9	3.8	3.6	3.5	3.2
Industrial chemicals	281-82	5.0	5.4	5.1	5.0	4.7	4.6	4.8	4.3	4.4	4.2	3.9	3.8	3.8	3.2
Drugs and medicines	283	3.6	4.1	4.7	6.3	6.4	7.3	8.0	7.2	7.2	7.6	7.5	7.3	7.3	7.3
Other chemicals	284-89	1.3	1.5	2.8	2.5	2.3	2.2	2.3	2.2	2.1	1.8	1.9	1.8	1.6	1.4
Petroleum refining and extraction	28,13	.7	1.1	1.0	1.1	1.0	.9	.8	.8	.9	1.0	.9	.8	.7	.5
Rubber products	30	1.7	1.8	2.3	2.0	1.9	1.9	1.9	2.0	1.9	1.9	1.8	1.9	1.6	1.7
Stone, clay, and glass products	32	(²)	(²)	1.6	1.6	1.6	1.5	1.8	1.6	1.7	1.7	1.7	1.6	1.5	1.5
Primary metals	33	.5	.7	.8	.8	.8	.7	.8	.8	.8	.8	.8	.7	.6	.5
Ferrous metals and products ³	331-32,3391,3399	(¹)	.6	.7	.7	.7	.7	.8	.7	.7	.7	.7	.6	.5	.4
Nonferrous metals and products	333-36,3392	(¹)	.7	1.1	1.0	.9	.8	1.0	1.0	1.0	1.0	1.0	.9	.8	.8
Fabricated metal products	34	1.6	1.7	1.6	1.5	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.2	1.1
Machinery	35	3.4	3.8	4.2	4.2	4.0	3.9	4.2	4.1	3.9	3.8	3.9	3.9	4.0	4.0
Office, computing, and accounting machines	357	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	9.7	9.6	10.0
Electrical equipment and communication	36,48	7.6	10.3	10.1	9.9	9.1	8.5	8.6	8.5	7.9	7.4	7.3	7.3	7.2	6.9
Radio and TV receiving equipment	365	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	2.0	1.9	2.2	2.2	2.7	2.4	1.6	1.7	1.7
Electronic components	367	(¹)	11.3	13.0	13.0	11.4	10.3	10.3	10.0	8.9	8.3	8.3	5.6	5.5	4.9
Communication equipment & communication	366,48	(¹)	9.7	7.3	7.0	7.0	7.3	7.3	7.4	7.3	6.6	6.4	6.3	6.3	6.2
Other electrical equipment	361-64,369	(¹)	9.7	7.3	7.0	7.0	7.3	7.3	7.4	7.3	6.6	6.4	6.3	6.3	6.2
Motor vehicles and motor vehicles equipment	371	2.9	4.2	3.4	3.6	3.1	3.2	3.4	3.1	3.1	3.5	3.1	3.3	3.5	3.7
Other transportation equipment	373-75,379	16.8	17.7	26.7	28.3	27.0	23.7	19.7	17.4	18.3	16.0	15.9	16.2	12.9	12.5
Aircraft and missiles	372,19	7.0	7.8	5.9	6.0	5.9	5.5	5.4	5.8	5.7	5.5	5.6	5.5	5.5	5.4
Professional and scientific instruments	38	9.5	10.2	4.1	4.3	4.0	3.7	3.9	3.9	3.3	3.2	3.2	3.3	3.0	2.8
Scientific and mechanical measuring instruments	381-82	5.2	6.3	6.9	6.8	6.7	6.1	6.0	6.4	6.5	6.3	6.4	6.2	6.3	6.2
Optical, surgical, photographic, and other instruments	383-87	(¹)	1.3	.7	.7	.7	.6	.6	.7	.7	.8	.8	.8	.8	.8
Other manufacturing industries	21,27,31,39	(¹)	1.3	.7	.7	.7	.6	.6	.7	.7	.8	.8	.8	.8	.8
<i>Distribution by size of company (based on number of employees)</i>															
Less than 1,000		1.8	1.3	1.9	2.4	2.1	2.7	1.7	(¹)	(¹)	1.9	1.7	1.7	1.6	1.7
1,000 to 4,999		¹ 1.8	1.8	2.4	1.8	2.0	2.3	1.7	(¹)	(¹)	1.7	1.6	1.7	1.6	1.6
5,000 to 9,999							1.9	2.1	2.3	2.1	2.3	2.2	1.9	1.8	1.6
10,000 to 24,999		¹ 3.9	4.8	5.3	5.3	4.5	5.3	5.2	4.7	4.7	4.4	4.2	2.0	1.8	1.5
25,000 or more													4.7	4.5	3.9

¹ Not separately available but included in total.

² Included in the other manufacturing industries group.

³ SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957-1965.

⁴ Included in the other electrical equipment group.

⁵ Separate data for companies with 5,000 or more employees and for companies with 1,000 to 4,999 employees were estimated by the National Science Foundation for 1957. Revisions of R&D statistics by the U.S. Bureau of the Census for this year did not yield separate data for companies in these size groups.

⁶ Data not tabulated at this level prior to 1972.

Source: National Science Foundation.

Table B-37.—Company R&D funds as percent of net sales in R&D-performing manufacturing companies,
by industry and size of company: 1957-58 and 1963-74

Industry and size of company	SIC code	1957	1958	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total		1.5	1.6	1.9	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.1	2.0	2.0	1.9
<i>Distribution by industry</i>															
Food and kindred products	20	.3	.3	(¹)	(¹)	.4	.4	.5	.5	.4	.5	.5	.4	.4	.4
Textiles and apparel	22,23	(¹)	.2	.4	.4	.4	(¹)	(¹)	(¹)	(¹)	(¹)	.5	.4	.4	.4
Lumber, wood products, and furniture	24,25	(¹)	.4	(¹)	(¹)	(¹)	.4	.3	.4	.4	.8	(¹)	(¹)	(¹)	(¹)
Paper and allied products	26	.6	.7	.8	.8	.8	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	.8	(¹)	(¹)
Chemicals and allied products	28	3.1	3.2	3.6	3.8	3.7	3.8	4.0	3.7	3.8	3.5	3.4	3.3	3.1	2.8
Industrial chemicals	281-82	4.2	4.3	4.1	4.2	3.9	3.8	3.9	3.6	3.6	3.6	3.3	3.2	3.0	2.7
Drugs and medicines	283	3.6	4.0	4.5	5.6	5.4	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Other chemicals	284-89	1.2	1.3	1.8	1.9	2.0	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Petroleum refining and extraction	29,13	.7	1.1	1.2	1.0	.9	.9	.8	.8	.9	.9	.8	.7	.7	.5
Rubber products	30	1.1	1.4	1.6	1.6	1.7	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.6	1.5
Stone, clay, and glass products	32	(²)	(²)	1.6	1.5	1.5	1.5	1.7	1.6	1.7	1.7	1.6	1.5	1.5	1.5
Primary metals	33	.5	.6	.7	.7	.7	.7	.8	.8	.8	.8	.8	.7	.6	.5
Ferrous metals and products ³	331-32,3391,3399	(¹)	.6	.7	.6	.7	.7	.7	.7	.7	.7	.7	.4	.5	.4
Nonferrous metals and products	333-36,3392	(¹)	.6	.9	.9	.9	.8	.9	.9	.9	.9	1.0	.9	.8	.8
Fabricated metal products	34	1.1	1.1	1.4	1.3	1.2	1.1	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1
Machinery	35	2.0	2.1	3.1	3.2	3.1	3.0	3.2	3.1	3.3	3.3	3.2	3.2	3.4	3.4
Office, computing, and accounting machines	357	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(¹)	(¹)	(¹)
Electrical equipment and communication	36,48	2.6	3.3	3.6	3.6	3.6	3.4	3.5	3.7	3.6	3.5	3.6	3.6	3.6	3.6
Radio and TV receiving equipment	365	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Electronic components	367	(¹)	3.3	4.2	4.3	4.3	3.8	3.9	4.0	3.7	3.8	3.8	3.2	3.3	3.0
Communication equipment & communication	366,48	(¹)	3.3	4.2	4.3	4.3	3.8	3.9	4.0	3.7	3.8	3.8	4.1	4.2	4.2
Other electrical equipment	361-64,369	(¹)	3.3	3.0	3.1	3.0	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	2.1	2.8	2.5	2.6	2.3	2.4	2.5	2.3	2.5	2.8	2.6	2.8	2.9	3.2
Other transportation equipment	373-75,379	2.0	2.3	2.6	2.5	3.4	3.4	4.0	3.7	4.2	3.7	3.3	3.1	2.8	2.8
Aircraft and missiles	372,19	3.9	4.1	4.2	4.2	4.0	3.8	3.5	3.7	3.8	4.0	4.3	4.3	4.4	4.4
Professional and scientific instruments	38	4.0	4.0	3.1	3.1	2.9	2.8	2.5	2.6	2.3	2.4	2.6	2.7	2.4	2.4
Scientific and mechanical measuring instruments	381-82	3.8	4.1	4.8	4.8	4.4	4.1	3.9	4.1	4.4	4.5	4.9	4.9	5.1	5.1
Optical, surgical, photographic, and other instruments	383-87	(¹)	(¹)	.6	.6	.7	(¹)	(¹)	(¹)	.7	.8	(¹)	(¹)	(¹)	(¹)
Other manufacturing industries	21,27,31,39	(¹)	(¹)	.6	.6	.7	(¹)	(¹)	(¹)	.7	.8	(¹)	(¹)	(¹)	(¹)
<i>Distribution by size of company (based on number of employees)</i>															
Less than 1,000		1.4	.7	1.5	1.4	1.7	1.4	1.6	(¹)	(¹)	1.6	1.5	1.5	1.5	1.5
1,000 to 4,999		1.2	1.3	1.5	1.6	2.1	1.3	1.4	(¹)	(¹)	1.3	1.3	1.3	1.3	1.2
5,000 to 9,999		1.6	1.9	2.1	2.1	2.1	1.5	1.6	1.6	1.7	1.8	1.8	1.5	1.5	1.4
10,000 to 24,999		1.6	1.9	2.1	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.3	1.4	1.3	1.2
25,000 or more		1.6	1.9	2.1	2.1	2.1	2.2	2.3	2.3	2.4	2.4	2.3	2.5	2.4	2.3

¹ Not separately available but included in total.

² Data included in the other manufacturing industries group.

³ SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957 to 1965.

⁴ Included in other electrical equipment group.

⁵ Estimated by the National Science Foundation.

⁶ Data not tabulated at this level prior to 1972.

Source: National Science Foundation.

Table B-38.—R&D funds as percent of net sales in R&D-performing manufacturing companies ranked by size of R&D program, by industry: 1974

Industry	SIC code	First 4 companies	Next 4 companies	Next 12 companies
Total		9.6	8.5	11.7
Food and kindred products	20	.6	.5	.4
Textiles and apparel	22,23	.5	.5	.3
Lumber, wood products, and furniture	24,25	.7	.6	.7
Paper and allied products	26	1.3	.5	.4
Chemicals and allied products	28	3.7	3.4	3.7
Industrial chemicals	281-82	4.5	3.1	2.0
Drugs and medicines	283	8.6	7.0	6.8
Other chemicals	284-89	1.2	1.5	1.5
Petroleum refining and extraction	29,13	.6	.5	.3
Rubber products	30	1.9	1.2	2.0
Stone, clay, and glass products	32	2.4	1.0	.6
Primary metals	33	.6	.5	.6
Ferrous metals and products	331-32,3391,3399	.5	.3	.5
Nonferrous metals and products	333-36,3392	1.0	.6	.8
Fabricated metal products	34	1.6	1.0	.9
Machinery	35	9.3	3.9	2.5
Office, computing, and accounting machines	357	11.6	4.5	4.0
Electrical equipment and communication	36,48	9.8	7.7	5.6
Radio and TV receiving equipment	365	1.8	1.0	1.4
Electronic components	367	6.1	4.4	3.7
Communication equipment & communication	366,48	8.8	8.0	7.8
Other electrical equipment	361-64,369	9.0	2.6	2.2
Motor vehicles and motor vehicles equipment	371	4.2	2.0	.8
Other transportation equipment	373-75,379	.5	.8	.4
Aircraft and missiles	372,19	20.5	14.0	6.5
Professional and scientific instruments	38	8.6	3.2	3.7
Scientific and mechanical measuring instruments	381-82	2.7	2.3	3.1
Optical, surgical, photographic, and other instruments	383-87	8.6	3.5	3.8
Other manufacturing industries	21,27,31,39	1.0	.9	.8

Source: National Science Foundation.

Table B-39.—Company R&D funds as percent of net sales in R&D-performing manufacturing companies ranked by size of net sales, by industry: 1974

[Dollars in millions]

Industry	SIC code	Company R&D funds		Net sales		Company R&D funds as percent of net sales	
		First 8 companies	Next 12 companies	First 8 companies	Next 12 companies	First 8 companies	Next 12 companies
Total		\$2,430	\$2,966	\$125,236	\$77,471	1.9	3.8
Food and kindred products	20	77	90	24,394	18,998	.3	.5
Textiles and apparel	22,23	25	20	7,426	4,727	.3	.4
Lumber, wood products, and furniture	24,25	41	10	6,728	1,607	.6	.6
Paper and allied products	26	117	68	16,419	9,670	.7	.7
Chemicals and allied products	28	925	501	31,285	14,284	3.0	3.5
Industrial chemicals	281-82	743	260	24,975	9,973	3.0	2.6
Drugs and medicines	283	441	228	5,740	3,192	7.7	7.1
Other chemicals	284-89	181	63	15,097	4,160	1.2	1.5
Petroleum refining and extraction	29,13	444	119	89,634	34,974	.5	.3
Rubber products	30	211	28	13,026	1,788	1.6	1.6
Stone, clay, and glass products	32	145	27	8,032	3,038	1.8	.9
Primary metals	33	157	78	30,229	15,890	.5	.5
Ferrous metals and products	331-32,3391,3399	112	27	27,769	7,190	.4	.4
Nonferrous metals and products	333-36,3392	105	29	14,194	4,012	.7	.7
Fabricated metal products	34	122	35	10,255	4,147	1.2	.8
Machinery	35	1,375	235	23,657	11,309	5.8	2.1
Office, computing, and accounting machines	357	(¹)	(¹)	14,416	831	(¹)	(¹)
Electrical equipment and communication	36,48	1,909	241	43,155	14,963	4.4	1.6
Radio and TV receiving equipment	365	(¹)	(¹)	2,874	116	(¹)	(¹)
Electronic components	367	156	62	5,370	1,495	2.9	4.1
Communication equipment & communication	366,48	1,332	153	29,508	5,299	4.5	2.9
Other electrical equipment	361-64,369	(¹)	(¹)	22,296	4,041	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	2,025	46	58,240	5,712	3.5	.8
Other transportation equipment	373-75,379	20	4	4,373	955	.5	.4
Aircraft and missiles	372,19	841	247	24,063	13,054	3.5	1.9
Professional and scientific instruments	38	608	99	11,007	3,253	5.5	3.0
Scientific and mechanical measuring instruments	381-82	46	32	2,392	1,040	1.9	3.1
Optical, surgical, photographic, and other instruments	383-87	614	166	10,128	2,314	6.1	7.2
Other manufacturing industries	21,27,31,39	78	48	10,626	5,447	.7	.9

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-40.—Expenditures for energy research and development, by selected industry and source of funds: 1973-75

[Dollars in millions]

Industry	SIC code	1973			1974			1975 (est.)
		Total	Federal	Company	Total	Federal	Company	Total
Total		\$1,004	\$385	\$619	\$1,197	\$479	\$718	\$1,266
Chemicals and allied products	28	58	(¹)	(¹)	84	(¹)	(¹)	92
Industrial chemicals	281-82	57	(¹)	(¹)	82	(¹)	(¹)	90
Petroleum refining and extraction	29,13	313	(¹)	(¹)	372	(¹)	(¹)	416
Primary metals	33	17	(¹)	(¹)	22	(¹)	(¹)	28
Machinery	35	11	(¹)	(¹)	13	(¹)	(¹)	14
Electrical equipment & communication	36,48	318	244	74	374	292	82	400
Aircraft and missiles	372,19	101	(¹)	(¹)	129	(¹)	(¹)	105
Professional and scientific instruments	38	13	(¹)	(¹)	14	(¹)	(¹)	15
Other manufacturing industries		135	(¹)	(¹)	139	(¹)	(¹)	139
Nonmanufacturing industries	07-12,14-17, 41-47,49-67, 739,807,891	38	7	31	50	7	43	57

¹Not separately available but included in total.

Source: National Science Foundation.

Table B-41.—Industrial expenditures for energy research and development, by primary energy source and source of funds: 1973-75

[Dollars in millions]

Primary energy source	1973			1974			1975 (est.)
	Total	Federal	Company	Total	Federal	Company	Total
Total	\$1,004	\$385	\$619	\$1,197	\$479	\$718	\$1,266
Fossil fuel	433	10	423	506	13	493	524
Oil	297	2	295	336	3	333	326
Gas	51	(¹)	(¹)	61	(¹)	(¹)	62
Shale	7	0	7	10	(¹)	(¹)	14
Coal	49	7	42	66	9	57	86
Other	29	(¹)	(¹)	33	(¹)	(¹)	36
Nuclear	501	366	135	600	444	156	631
Fission	476	349	127	566	421	145	603
Fusion	25	18	7	34	23	11	28
Geothermal	1	(¹)	(¹)	2	(¹)	(¹)	5
Solar	2	(¹)	(¹)	7	(¹)	(¹)	11
All other	67	8	59	82	19	63	95

¹Not separately available but included in total.

Source: National Science Foundation.

Table B-42.—Expenditures for pollution abatement research and development, by industry and source of funds: 1973-75

[Dollars in millions]

Industry	SIC code	1973			1974			1975 (est.)
		Total	Federal	Company	Total	Federal	Company	Total
Total		\$603	\$35	\$568	\$646	\$52	\$594	\$621
Food and kindred products	20	4	0	4	4	0	4	4
Textiles and apparel	22,23	(¹)	0	(¹)	(¹)	0	(¹)	(¹)
Lumber, wood products, and furniture ..	24,25	3	0	3	5	0	5	5
Paper and allied products	26	1	0	1	2	0	2	4
Chemicals and allied products	28	55	(¹)	(¹)	66	(¹)	(¹)	69
Industrial chemicals	281-82	42	(¹)	(¹)	52	(¹)	(¹)	54
Drugs and medicines	283	(¹)	0	(¹)	(¹)	0	(¹)	(¹)
Other chemicals	284-89	(¹)	0	(¹)	(¹)	0	(¹)	(¹)
Petroleum refining and extraction	29,13	51	1	50	61	2	59	67
Rubber products	30	1	(¹)	(¹)	2	(¹)	(¹)	2
Stone, clay, and glass products	32	4	0	4	7	0	7	5
Primary metals	33	9	0	9	14	0	14	17
Ferrous metals and products	331-32							
3391,3399		8	0	8	11	0	11	14
Nonferrous metals and products	333-36,3392	1	0	1	3	0	3	4
Fabricated metal products	34	(¹)	0	(¹)	(¹)	(¹)	(¹)	(¹)
Machinery	35	14	0	14	25	1	24	25
Office, computing, and accounting machines	357	0	0	0	0	0	0	0
Electrical equipment and communication	36,48	13	(¹)	(¹)	15	(¹)	(¹)	13
Radio and TV receiving equipment ..	365	0	0	0	(¹)	0	(¹)	0
Electronic components	367	0	0	0	(¹)	0	(¹)	(¹)
Communication equipment & communication	366,48	(¹)	0	(¹)	(¹)	(¹)	(¹)	(¹)
Other electrical equipment	361-64,369	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	380	(¹)	(¹)	371	(¹)	(¹)	330
Other transportation equipment	373-75,379	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Aircraft and missiles	372,19	25	16	9	34	21	13	30
Professional and scientific instruments ..	38	2	(¹)	(¹)	3	(¹)	(¹)	3
Scientific and mechanical measuring instruments	381-82	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Optical, surgical, photographic and other instruments	383-87	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Other manufacturing industries	21,27,31,39	2	0	2	3	0	3	3
Nonmanufacturing industries	07-12,14-17, 41-47,49-67, 739,807,891	35	0	35	28	(¹)	(¹)	38

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-43.—Industrial expenditures for pollution abatement research and development, by type of pollution and source of funds: 1973-75

[Dollars in millions]

Type of pollution	1973			1974			1975 (est.)
	Total	Federal	Company	Total	Federal	Company	Total
Total	\$603	\$35	\$568	\$646	\$52	\$594	\$621
Air	461	10	451	488	18	470	468
Water	76	(¹)	(¹)	74	(¹)	(¹)	79
Solid waste	10	(¹)	(¹)	18	(¹)	(¹)	19
Other	56	21	35	66	19	37	54

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-44.—Funds for basic research, applied research, and development: 1953-74

[Dollars in millions]

Year	Total	Basic research	Applied research	Development
1953	\$3,630	\$151	\$1,726	\$1,753
1954	4,070	166	1,814	1,309
1955	4,640	189	1,928	1,352
1956	6,605	253	1,268	5,084
1957	7,731	271	1,670	5,790
1958	8,389	295	1,911	6,183
1959	9,618	320	1,991	7,307
1960	10,509	376	2,029	8,104
1961	10,908	395	1,977	8,537
1962	11,464	488	2,449	8,527
1963	12,630	522	2,457	9,651
1964	13,512	549	2,600	10,362
1965	14,185	592	2,658	10,934
1966	15,548	624	2,843	12,081
1967	16,385	629	2,915	12,842
1968	17,429	642	3,124	13,663
1969	18,308	618	3,287	14,403
1970	18,062	602	3,426	14,034
1971	18,311	581	3,413	14,318
1972	19,383	579	3,471	15,333
1973	20,921	621	3,739	16,562
1974	22,369	683	4,129	17,557

¹ Estimated by the National Science Foundation.

Source: National Science Foundation.

Table B-45.—Funds for basic research, applied research, and development, by industry and selected company size group: 1973 and 1974

[Dollars in millions]

Industry and size of company	SIC code	1973				1974			
		Total	Basic research	Applied research	Development	Total	Basic research	Applied research	Development
Total		\$20,921	\$621	\$3,739	\$16,562	\$22,369	\$683	\$4,129	\$17,557
<i>Distribution by industry</i>									
Food and kindred products	20	268	21	99	148	294	22	110	162
Textiles and apparel	22,23	64	1	24	39	68	2	23	44
Lumber, wood products, and furniture	24,25	55	(¹)	(¹)	(¹)	67	(¹)	(¹)	(¹)
Paper and allied products	26	194	5	65	124	219	5	70	144
Chemicals and allied products	28	2,062	222	841	999	2,364	267	940	1,157
Industrial chemicals	281-82	1,135	126	489	520	1,322	159	561	602
Drugs and medicines	283	616	76	248	292	703	87	268	349
Other chemicals	284-89	312	20	104	188	338	21	111	206
Petroleum refining and extraction	29,13	498	26	219	253	598	32	257	309
Rubber products	30	280	3	58	219	291	4	62	225
Stone, clay, and glass products	32	175	11	57	107	189	12	61	116
Primary metals	33	276	8	114	155	316	9	132	175
Ferrous metals and products	331-32,3391,3399	147	(¹)	(¹)	(¹)	163	(¹)	(¹)	(¹)
Nonferrous metals and products	333-36,3392	130	(¹)	(¹)	(¹)	153	(¹)	(¹)	(¹)
Fabricated metal products	34	273	10	55	209	288	5	59	224
Machinery	35	2,191	24	298	1,869	2,493	26	323	2,144
Office, computing, and accounting machines	357	1,319	(¹)	(¹)	(¹)	1,539	(¹)	(¹)	(¹)
Electrical equipment and communication	36,48	5,280	176	822	4,282	5,487	181	854	4,453
Radio and TV receiving equipment	365	49	(¹)	(¹)	(¹)	51	(¹)	(¹)	(¹)
Electronic components	367	378	23	55	300	383	20	53	310
Communication equipment & communication	366,48	3,039	136	482	2,421	3,032	141	473	2,418
Other electrical equipment	361-64,369	1,814	(¹)	(¹)	(¹)	2,021	(¹)	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	2,410	8	149	2,253	2,392	9	154	2,230
Other transportation equipment	373-75,379	27	(¹)	(¹)	(¹)	31	(¹)	(¹)	(¹)
Aircraft and missiles	372,19	5,084	50	515	4,519	5,311	53	615	4,644
Professional and scientific instruments	38	911	22	96	792	1,008	22	111	875
Scientific and mechanical measuring instruments	381-82	117	(¹)	(¹)	(¹)	121	(¹)	(¹)	(¹)
Optical, surgical, photographic, and other instruments	383-87	794	(¹)	(¹)	(¹)	887	(¹)	(¹)	(¹)
Other manufacturing industries	21,27,31,39	158	7	38	113	174	8	40	126
Nonmanufacturing industries	07-12-14-17,41-47,49-67,739,807,891	715	26	274	415	779	26	300	454
<i>Distribution by size of company (based on number of employees)</i>									
5,000 to 9,999		1,151	75	342	734	1,255	80	384	791
10,000 to 24,999		2,203	98	583	1,522	2,313	111	603	1,599
25,000 or more		15,413	357	2,254	12,802	16,455	414	2,534	13,508

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-46.—Funds for basic research, applied research, and development, by industry, source of funds, and selected company size group: 1974

[Dollars in millions]

Industry and size of company	SIC code	Federal				Company			
		Total	Basic research	Applied research	Development	Total	Basic research	Applied research	Development
Total		\$8,332	\$159	\$1,074	\$7,098	\$14,038	\$523	\$3,055	\$10,459
<i>Distribution by industry</i>									
Food and kindred products	20	1	(¹)	(¹)	(¹)	293	(¹)	(¹)	(¹)
Textiles and apparel	22,23	1	(¹)	(¹)	(¹)	67	2	(¹)	(¹)
Lumber, wood products, and furniture	24,25	(¹)	(¹)	0	(¹)	(¹)	(¹)	(¹)	(¹)
Paper and allied products	26	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Chemicals and allied products	28	216	49	68	101	2,148	219	872	1,056
Industrial chemicals	281-82	202	(¹)	(¹)	(¹)	1,121	(¹)	(¹)	(¹)
Drugs and medicines	283	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Other chemicals	284-89	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Petroleum refining and extraction	29,13	20	(¹)	14	(¹)	578	(¹)	243	(¹)
Rubber products	30	30	(¹)	1	29	261	4	61	196
Stone, clay, and glass products	32	1	0	(¹)	(¹)	187	12	(¹)	(¹)
Primary metals	33	8	(¹)	4	(¹)	308	(¹)	127	(¹)
Ferrous metals and products	331-32,3391,3399	4	(¹)	(¹)	(¹)	159	(¹)	(¹)	(¹)
Nonferrous metals and products	333-36,3392	4	(¹)	(¹)	(¹)	149	(¹)	(¹)	(¹)
Fabricated metal products	34	13	(¹)	(¹)	12	274	(¹)	(¹)	211
Machinery	35	359	(¹)	(¹)	255	2,134	(¹)	(¹)	1,889
Office, computing, and accounting machines	367	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Electrical equipment and communication	36,48	2,579	64	295	2,220	2,908	117	559	2,233
Radio and TV receiving equipment	365	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Electronic components	367	148	(¹)	(¹)	(¹)	236	(¹)	(¹)	(¹)
Communication equipment & communication	366,48	1,480	46	152	1,282	1,552	96	321	1,136
Other electrical equipment	361-64,369	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	306	(¹)	(¹)	294	2,086	(¹)	(¹)	1,936
Other transportation equipment	373-75,379	5	0	(¹)	(¹)	26	(¹)	(¹)	(¹)
Aircraft and missiles	372,19	4,139	19	363	3,757	1,171	33	251	887
Professional and scientific instruments	38	184	11	10	162	824	11	100	712
Scientific and mechanical measuring instruments	381-82	20	(¹)	(¹)	(¹)	101	(¹)	(¹)	(¹)
Optical, surgical, photographic, and other instruments	383-87	164	(¹)	(¹)	(¹)	723	(¹)	(¹)	(¹)
Other manufacturing industries	21,27,31,39	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	464	13	200	251	225	12	100	203
<i>Distribution by size of company (based on number of employees)</i>									
5,000 to 9,999		187	11	51	125	1,067	69	333	666
10,000 to 24,999		458	34	57	367	1,854	77	546	1,232
25,000 or more		6,923	85	734	6,104	9,532	328	1,799	7,404

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-47.—Funds for basic research, by industry and size of company:
1957-58 and 1963-74

[Dollars in millions]

Industry and size of company	SIC code	1957 ¹	1958 ¹	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total		\$271	\$295	\$522	\$549	\$592	\$624	\$629	\$642	\$618	\$602	\$581	\$579	\$621	\$683
<i>Distribution by industry</i>															
Food and kindred products	20	4	5	12	14	10	13	17	17	18	20	20	20	21	22
Textiles and apparel	22,23	1	1	1	(²)	(²)	1	2	2	2	2	2	2	1	2
Lumber, wood products, and furniture	24,25	0	0	0	(²)	(²)	0	0	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Paper and allied products	26	1	(²)	2	2	3	4	4	4	4	5	4	4	5	5
Chemicals and allied products	28	82	92	152	153	173	176	184	201	206	203	212	206	222	267
Industrial chemicals	281-82	(²)	(²)	105	105	119	(²)	(²)	(²)	(²)	(²)	120	118	126	159
Drugs and medicines	283	18	21	33	35	38	45	45	59	65	62	72	69	76	87
Other chemicals	284-89	6	6	14	(²)	(²)	9	14	13	13	18	20	18	20	21
Petroleum refining and extraction	29,13	35	34	34	37	34	29	36	37	38	26	21	22	26	32
Rubber products	30	4	(²)	8	(²)	(²)	5	5	6	7	5	4	4	3	4
Stone, clay, and glass products	32	(²)	(²)	6	5	9	(²)	(²)	(²)	(²)	(²)	9	11	11	12
Primary metals	33	6	7	11	11	13	12	13	14	16	18	17	9	8	9
Ferrous metals and products ⁴	331-32,3391,3399	5	5	8	8	10	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Nonferrous metals and products	333-36,3392	(²)	2	3	3	3	3	4	5	8	8	(²)	(²)	(²)	(²)
Fabricated metal products	34	1	1	5	4	4	4	3	3	3	4	(²)	6	10	5
Machinery	35	17	20	25	26	22	26	26	31	21	20	20	23	24	26
Office, computing, and accounting machines	357	(⁶)	(⁶)	(⁶)	(⁶)	(⁶)	(⁶)	(⁶)	(⁶)	(⁶)	(⁶)	(⁶)	(²)	(²)	(²)
Electrical equipment and communication	36,48	53	63	133	134	148	122	131	134	134	144	145	154	176	181
Radio and TV receiving equipment	365	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Electronic components	367												19	23	20
Communication equipment & communication	366,48	36	43	110	112	121	96	112	115	118	127	127	117	136	141
Other electrical equipment	361-64,369	17	21	23	22	27	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)
Motor vehicles and motor vehicles equipment	371	5	(²)	28	38	37	(²)	(²)	(²)	(²)	(²)	13	10	8	9
Other transportation equipment	373-75,379												(²)	(²)	(²)
Aircraft and missiles	372,19	25	26	59	66	74	74	73	71	67	63	54	61	50	53
Professional and scientific instruments	38	8	10	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	16	14	22	22
Scientific and mechanical measuring instruments	381-82	3	2	4	3	3	(²)	(²)	(²)	(²)	(²)	4	3	(²)	(²)
Optical, surgical, photographic, and other instruments	383-87	6	8	(²)	(²)	(²)	(²)	(²)	(²)	(²)	(²)	12	11	(²)	(²)
Other manufacturing industries	21,27,31,39	13	8	3	4	4	4	5	5	5	5	7	6	7	8
Nonmanufacturing industries	07-12,14-17,41-47,49-67,739,807,891	(²)	(²)	28	25	29	51	52	45	43	38	31	27	26	26
<i>Distribution by size of company (based on number of employees)</i>															
Less than 1,000		(²)	(²)	(²)	(²)	(²)	39	56	(²)	(²)	38	36	36	32	28
1,000 to 4,999		24	32	31	34	40	67	45	(²)	(²)	58	51	45	58	50
5,000 to 9,999							38	50	55	62	62	72	58	75	80
10,000 to 24,999		218	240	439	461	488	480	478	490	469	498	480	90	98	111
25,000 or more													350	357	414

¹ Estimated by the National Science Foundation.

² Not separately available but included in total.

³ Data included in the other manufacturing industries group.

⁴ SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957 to 1965.

⁵ Included in the other electrical equipment group.

⁶ Data not tabulated at this level prior to 1972.

Source: National Science Foundation.

Table B-48.—Funds for basic research, by field of science: 1967-74

[Dollars in millions]

	1967	1968	1969	1970	1971	1972	1973	1974
Total	\$629	\$642	\$618	\$602	\$581	\$579	\$621	\$683
Physical sciences	308	317	324	297	281	275	273	318
Chemistry	162	191	213	196	180	181	192	230
Physics	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Astronomy	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Mathematics	12	13	13	13	14	12	14	14
Environmental sciences	14	11	11	8	8	6	7	10
Atmospheric sciences	(¹)	(¹)	(¹)	(¹)	3	(¹)	2	3
Geological sciences	(¹)	(¹)	(¹)	(¹)	3	4	3	5
Oceanography	(¹)	(¹)	(¹)	(¹)	2	(¹)	2	2
Engineering (including metallurgy)	172	181	170	170	159	182	182	169
Life sciences	69	76	74	86	94	81	100	112
Biological sciences	(¹)	50	58	51	57	60	75	83
Clinical medical sciences	(¹)	26	16	35	37	21	25	27
Other sciences	53	43	26	28	24	23	46	59

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-49.—Funds for basic research, by industry and field of science: 1974

[Dollars in millions]

Industry	SIC code	Total	Physical sciences	Mathematics	Environmental sciences	Engineering (including metallurgy)	Life sciences	Other sciences
Total		\$683	\$318	\$14	\$10	\$169	\$112	\$59
Food and kindred products	20	22	8	(¹)	0	(¹)	11	(¹)
Textiles and apparel	22,23	2	1	0	0	(¹)	(¹)	(¹)
Lumber, wood products, and furniture	24,25	(¹)	(¹)	0	(¹)	(¹)	(¹)	(¹)
Paper and allied products	26	5	4	0	0	(¹)	(¹)	(¹)
Chemicals and allied products	28	267	186	(¹)	(¹)	15	59	(¹)
Industrial chemicals	281-82	159	120	(¹)	(¹)	12	23	(¹)
Drugs and machines	283	87	53	0	(¹)	(¹)	31	(¹)
Other chemicals	284-89	21	13	0	0	(¹)	5	(¹)
Petroleum refining and extraction	29,13	32	20	(¹)	3	5	2	(¹)
Rubber products	30	4	2	(¹)	0	(¹)	1	(¹)
Stone, clay, and glass products	32	12	9	(¹)	0	(¹)	0	(¹)
Primary metals	33	9	2	(¹)	(¹)	6	0	(¹)
Ferrous metals and products	331-32,3391,3399	(¹)	(¹)	(¹)	(¹)	(¹)	0	(¹)
Nonferrous metals and products	333-36,3392	(¹)	(¹)	(¹)	(¹)	(¹)	0	0
Fabricated metal products	34	5	(¹)	0	0	1	(¹)	2
Machinery	35	26	11	(¹)	(¹)	(¹)	(¹)	(¹)
Office, computing, and accounting machines	367	(¹)	11	(¹)	(¹)	(¹)	(¹)	(¹)
Electrical equipment and communication	36,48	181	43	4	2	88	24	20
Radio and TV receiving equipment	365	(¹)	0	0	0	(¹)	(¹)	(¹)
Electronic components	367	20	(¹)	0	(¹)	16	(¹)	(¹)
Communication equipment & communication	366,48	141	34	(¹)	1	60	23	(¹)
Other electrical equipment	361-64,369	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Motor vehicles and motor vehicles equipment	371	9	5	(¹)	(¹)	1	(¹)	(¹)
Other transportation equipment	373-75,379	(¹)	0	(¹)	0	0	0	(¹)
Aircraft and missiles	372,19	53	13	(¹)	1	31	7	(¹)
Professional and scientific instruments	38	22	4	(¹)	(¹)	5	5	(¹)
Scientific and mechanical measuring instruments	381-82	(¹)	(¹)	0	(¹)	(¹)	(¹)	(¹)
Optical, surgical, photographic, and other instruments	383-87	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Other manufacturing industries	21,27,31,39	8	5	0	0	(¹)	(¹)	(¹)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	26	(¹)	(¹)	(¹)	10	(¹)	9

¹ Not separately available but included in total.

Source: National Science Foundation

Table B-50.—R&D-performing companies with 5,000 or more employees and number of companies performing basic research, by industry: 1974

Industry	SIC code	Companies with total employment of—					
		5,000 to 9,999		10,000 to 24,999		25,000 or more	
		R&D	Basic research	R&D	Basic research	R&D	Basic research
Total		210	57	183	74	126	73
Food and kindred products	20	19	5	18	4	11	4
Textiles and apparel	22,23	11	4	16	3	4	2
Lumber, wood products, and furniture	24,25	4	0	2	0	3	1
Paper and allied products	26	10	2	10	2	9	4
Chemicals and allied products	28	28	13	17	15	10	8
Industrial chemicals	281-82	9	4	6	6	9	8
Drugs and medicines	283	9	6	7	6	0	0
Other chemicals	284-89	10	3	4	3	1	0
Petroleum refining and extraction	29,13	5	2	6	6	9	8
Rubber products	30	4	1	2	2	4	3
Stone, clay, and glass products	32	7	4	6	1	4	3
Primary metals	33	12	4	12	6	12	5
Ferrous metals and products	331-32,3391,3399	10	2	7	2	8	1
Nonferrous metals and products	333-36,3392	2	2	5	4	4	4
Fabricated metal products	34	13	1	5	1	5	2
Machinery	35	32	4	18	6	12	6
Office, computing, and accounting machines	357	2	0	2	1	6	4
Electrical equipment and communication	36,48	18	4	19	11	15	9
Radio and TV receiving equipment	365	0	0	1	1	1	0
Electronic components	367	5	3	3	2	2	2
Communication equipment & communication	368,48	3	1	5	2	10	5
Other electrical equipment	361-64,369	10	0	10	6	2	2
Motor vehicles and motor vehicles equipment	371	6	2	7	1	6	4
Other transportation equipment	373-75,379	1	0	5	1	0	0
Aircraft and missiles	372,19	8	2	8	3	13	10
Professional and scientific instruments	38	11	5	9	3	3	2
Scientific and mechanical measuring instruments	381-82	8	2	1	1	0	0
Optical, surgical, photographic, and other instruments	383-87	3	3	8	2	3	2
Other manufacturing industries	21,27,31,39	9	3	11	5	2	1
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	12	1	12	4	4	1

Source: National Science Foundation.

Table B-51.—Funds for applied research and development by product field: 1963-74

[Dollars in millions]

Product field	SIC code	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Total		\$12,095	\$12,948	\$13,592	\$14,924	\$15,757	\$16,787	\$17,700	\$17,460	\$17,731	\$18,805	\$20,301	\$21,687
Atomic energy devices		609	709	642	627	675	0	0	0	0	0	0	0
Ordnance, except guided missiles	19, except 192	92	94	103	153	218	201	186	192	192	177	228	222
Guided missiles and spacecraft	192	3,345	3,496	3,772	4,031	3,741	3,786	3,711	3,115	2,832	2,647	2,491	2,480
Food and kindred products	20	102	118	131	130	134	165	179	204	207	222	234	262
Textile mill products	22	(¹)	(¹)	21	42	55	58	66	55	60	83	93	98
Chemicals, except drugs and medicines	28, except 283	861	949	1,019	1,036	1,119	1,168	1,214	1,339	1,345	1,244	1,330	1,510
Industrial inorganic and organic chemicals	281	242	304	330	324	347	382	390	398	398	371	383	435
Plastics materials and synthetic resins, rubber, and fibers	282	379	402	420	438	474	466	482	521	511	453	511	561
Agricultural chemicals	287	45	48	64	77	92	99	104	126	130	108	114	134
Other chemicals	284-86, 289	196	195	204	197	205	221	237	267	277	312	323	381
Drugs and medicines	283	227	234	274	322	346	375	417	474	535	521	586	658
Petroleum refining and extraction	29, 13	194	205	211	206	215	239	252	272	266	299	319	371
Rubber and miscellaneous plastics products	30	87	102	112	128	132	160	163	193	215	273	282	310
Stone, clay, and glass products	32	74	85	92	99	121	130	157	128	128	130	153	165
Primary metals	33	152	164	178	194	208	207	224	235	230	229	241	268
Ferrous metals and products	331, 332, 3391 and 3399	90	97	108	104	117	119	125	127	114	129	142	159
Nonferrous metals and products	balance of 33	62	68	70	90	91	88	99	108	116	100	99	109
Fabricated metal products	34	135	150	153	161	204	478	504	612	701	731	769	884
Machinery	35	913	970	1,113	1,254	1,293	1,396	1,562	1,676	1,783	1,948	2,226	2,510
Engines and turbines	351	124	126	138	173	192	203	196	204	246	312	353	406
Farm machinery and equipment	352	76	79	96	100	102	96	99	89	90	92	117	130
Construction, mining, and materials handling machinery	353	58	60	69	110	119	129	154	182	196	204	260	277
Metalworking machinery and equipment	354	58	66	52	76	67	90	83	86	84	75	68	74
Office, computing, and accounting machines	357	412	458	549	573	614	678	812	863	903	1,000	1,163	1,342
Other machinery, except electrical	balance of 35	185	182	209	222	199	201	218	252	264	266	265	282
Electrical equipment, except communication	36, except 365-67	277	305	319	375					688	756	820	890
Electric transmission and distribution equipment	361	47	46	51	69					181	184	196	217
Electrical industrial apparatus	362	77	84	87	111	3,053	3,363	3,409	3,372	187	225	252	280
Other electrical equipment and supplies	363-64 and 369	152	175	181	195					320	347	372	393
Communication equipment and electronic components	365-67	2,150	2,223	2,258	2,396					2,927	3,226	3,605	3,855
Motor vehicles and other transportation equipment	37, except 372	651	678	713	807	831	956	1,139	1,138	1,341	1,663	2,004	2,098
Motor vehicles and equipment	371	623	651	685	757	755	860	1,051	1,046	1,228	1,465	1,815	1,879
Other transportation equipment	373-75 and 379	28	27	28	50	76	96	88	90	113	198	190	218
Aircraft and parts	372	¹ 1,520	¹ 1,670	1,599	1,953	2,168	2,370	2,579	2,556	2,486	2,387	2,521	2,383
Professional and scientific instruments	38	298	346	372	481	535	719	814	724	652	830	938	1,043
Other product fields, not elsewhere classified		¹ 421	¹ 463	511	548	710	1,013	1,124	1,191	1,172	1,439	1,461	1,680

¹ Distributed according to SIC code from 1968 to present.² Not separately available but included in total.³ Estimated by the National Science Foundation.

Source: National Science Foundation.

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Table B-52.—Funds for applied research and development, by product field and source of funds: 1974

[Dollars in millions]

Product field	SIC code	Total	Federal	Company
Total		\$21,687	\$8,172	\$13,514
Ordnance, except guided missiles	19, except 192	222	164	58
Guided missiles and spacecraft	192	2,480	2,209	271
Food and kindred products	20	262	(¹)	(¹)
Textile mill products	22	98	0	98
Chemicals, except drugs and medicines	28, except 283	1,510	24	1,486
Industrial inorganic and organic chemicals	281	435	10	425
Plastics materials and synthetic resins, rubber, and fibers	282	561	9	552
Agricultural chemicals	287	134	(¹)	(¹)
Other chemicals	284-86, 289	381	(¹)	(¹)
Drugs and medicines	283	658	10	648
Petroleum refining and extraction	29, 13	371	(¹)	(¹)
Rubber and miscellaneous plastics products	30	310	(¹)	(¹)
Stone, clay, and glass products	32	165	(¹)	(¹)
Primary metals	33	268	10	258
Ferrous metals and products	331, 332, 3391 and 3399	159	(¹)	(¹)
Nonferrous metals and products	balance of 33	109	(¹)	(¹)
Fabricated metal products	34	884	381	503
Machinery	35	2,510	276	2,234
Engines and turbines	351	406	(¹)	(¹)
Farm machinery and equipment	352	130	(¹)	(¹)
Construction, mining, and materials handling machinery	353	277	(¹)	(¹)
Metalworking machinery and equipment	354	74	(¹)	(¹)
Office, computing, and accounting machines	357	1,342	173	1,169
Other machinery, except electrical	balance of 35	282	35	247
Electrical equipment, except communication	36, except 365-67	890	190	700
Electric transmission and distribution equipment	361	217	(¹)	(¹)
Electrical industrial apparatus	362	280	(¹)	(¹)
Other electrical equipment and supplies	363-64 and 369	393	(¹)	(¹)
Communication equipment and electronic components	365-67	3,855	2,020	1,835
Motor vehicles and other transportation equipment	37, except 372	2,098	(¹)	(¹)
Motor vehicles and equipment	371	1,879	(¹)	(¹)
Other transportation equipment	373-75 and 379	218	(¹)	(¹)
Aircraft and parts	372	2,383	1,585	798
Professional and scientific instruments	38	1,043	277	766
Other product fields, not elsewhere classified		1,680	825	855

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-53.—Funds for applied research and development, by industry and product field: 1974

[Dollars in millions]

Industry	SIC code	Total	Product field and SIC code																
			Ordnance, except guided missiles	Guided missiles and spacecraft	Food and kindred products	Textile mill products	Chemicals, except drugs and medicines	Drugs and medicines	Petroleum refining and extraction	Rubber products	Stone clay, and glass products	Primary metals	Fabricated metal products	Machinery	Electrical equipment and com- munication	Motor vehi- cles and other trans- portation equipment	Aircraft and parts	Profes- sional and scientific instru- ments	Other product fields, n.e.c.
			19, except 192	192	20	22	26, except 263	283	29,13	30	32	33	34	35	36	37, except 372	372	38	.....
Total		\$21,687	\$222	\$2,480	\$262	\$98	\$1,510	\$658	\$371	\$310	\$165	\$268	\$884	\$2,510	\$4,745	\$2,098	\$2,383	\$1,043	\$1,680
Food and kindred products	20	272	0	(¹)	203	(¹)	23	16	0	2	(¹)	(¹)	2	9	(¹)	(¹)	0	(¹)	10
Textiles and apparel	22,23	86	0	0	0	54	(¹)	(¹)	0	(¹)	0	(¹)	1	(¹)	0	(¹)	0	0	5
Lumber, wood products, and furniture	24,25	66	0	0	(¹)	0	7	0	0	(¹)	(¹)	(¹)	3	(¹)	(¹)	(¹)	0	0	46
Paper and allied products	26	214	0	0	0	(¹)	13	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	11	(¹)	0	0	(¹)	184
Chemicals and allied products	28	2,097	31	13	36	27	1,059	596	18	24	8	13	35	29	33	11	7	24	135
Industrial chemicals	281-82	1,163	(¹)	(¹)	9	(¹)	766	66	(¹)	15	(¹)	11	(¹)	26	26	11	0	11	103
Drugs and medicines	283	616	0	0	11	(¹)	61	505	0	6	(¹)	(¹)	(¹)	(¹)	(¹)	0	0	13	11
Other chemicals	284-89	317	(¹)	(¹)	16	0	233	26	(¹)	2	(¹)	(¹)	(¹)	(¹)	(¹)	0	7	0	21
Petroleum refining and extraction	29,13	566	(¹)	(¹)	(¹)	0	132	3	310	6	(¹)	7	62	(¹)	(¹)	(¹)	0	4	35
Rubber products	30	287	12	0	0	(¹)	31	(¹)	0	198	(¹)	(¹)	4	7	11	(¹)	5	(¹)	8
Stone, clay, and glass products	32	177	0	(¹)	(¹)	(¹)	19	0	(¹)	5	124	(¹)	(¹)	3	5	3	(¹)	3	10
Primary metals	33	307	(¹)	(¹)	(¹)	0	21	(¹)	(¹)	9	2	207	22	19	7	(¹)	(¹)	0	11
Ferrous metals and products	331-32,3391,3399	161	(¹)	0	0	0	10	(¹)	0	1	(¹)	120	9	12	1	(¹)	(¹)	0	4
Nonferrous metals and products	333-36,3392	146	(¹)	(¹)	(¹)	0	11	0	(¹)	8	(¹)	88	13	7	6	(¹)	(¹)	0	7
Fabricated metal products	34	283	(¹)	(¹)	(¹)	(¹)	21	2	2	5	2	3	186	21	9	5	3	(¹)	22
Machinery	35	2,467	2	2	2	(¹)	28	0	10	(¹)	(¹)	12	32	1,639	494	58	3	3	170
Office, computing, and accounting machines	357	1,519	0	0	(¹)	(¹)	12	0	(¹)	0	(¹)	(¹)	(¹)	986	391	(¹)	0	0	119
Electrical equipment and communication	36,48	5,307	84	484	4	(¹)	46	(¹)	0	3	13	7	435	379	3,058	38	354	134	286
Radio and TV receiving equipment	365	51	0	0	0	0	0	0	0	0	0	(¹)	(¹)	0	50	0	0	0	1
Electronic components	367	363	0	(¹)	(¹)	0	2	(¹)	0	(¹)	(¹)	(¹)	(¹)	5	330	2	(¹)	14	4
Communication equipment & communication	366,48	2,891	(¹)	314	(¹)	(¹)	11	0	0	(¹)	(¹)	(¹)	13	242	1,946	19	(¹)	78	217
Other electrical equipment	361-84,369	2,002	58	(¹)	(¹)	0	34	0	0	1	9	5	422	133	732	17	319	42	64
Motor vehicles and motor vehicles equipment	371	2,383	84	11	0	0	(¹)	0	(¹)	17	(¹)	4	10	185	291	1,746	(¹)	(¹)	20
Other transportation equipment	373-75,379	31	(¹)	(¹)	0	0	(¹)	0	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	1	11	(¹)	(¹)	3
Aircraft and missiles	372,19	5,258	16	1,929	(¹)	3	28	(¹)	(¹)	24	(¹)	7	57	89	679	185	1,970	(¹)	256
Professional and scientific instruments	38	985	(¹)	11	(¹)	(¹)	32	36	(¹)	3	3	(¹)	15	43	36	(¹)	8	763	22
Scientific and mechanical measuring instruments	381-82	109	(¹)	1	0	0	1	0	0	(¹)	1	(¹)	11	4	17	(¹)	(¹)	53	12
Optical, surgical, photographic, and other instruments	383-87	876	(¹)	10	(¹)	(¹)	31	36	(¹)	(¹)	3	(¹)	4	39	19	0	(¹)	711	10
Other manufacturing industries	21,27,31,39	166	(¹)	(¹)	7	(¹)	12	0	0	3	0	(¹)	7	14	11	13	(¹)	8	88
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	754	7	27	(¹)	0	16	(¹)	26	0	5	3	11	53	103	10	30	87	370

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-54.—Funds for applied research and development, by industry and product field: 1973

[Dollars in millions]

Industry	SIC code	Total	Product field and SIC code																
			Ordnance, except guided missiles	Guided missiles and spacecraft	Food and kindred products	Textile mill products	Chemicals, except drugs and medicines	Drugs and medicines	Petroleum refining and extraction	Rubber products	Stone clay, and glass products	Primary metals	Fabricated metal products	Machinery	Electrical equipment and com- munication	Motor vehi- cles and other trans- portation equipment	Aircraft and parts	Profes- sional and scientific instru- ments	Other product fields, n.e.c.
			19, except 192	192	20	22	28, except 283	283	29,13	30	32	33	34	35	36	37, except 372	372	38	.....
Total		\$20,301	\$228	\$2,491	\$234	\$93	\$1,330	\$586	\$319	\$282	\$153	\$241	\$769	\$2,226	\$4,425	\$2,004	\$2,521	\$938	\$1,461
Food and kindred products	20	246	0	(¹)	182	(¹)	22	15	0	2	(¹)	(¹)	3	9	(¹)	(¹)	0	(¹)	8
Textiles and apparel	22,23	63	0	0	0	52	(¹)	(¹)	0	(¹)	0	(¹)	1	(¹)	(¹)	(¹)	0	0	4
Lumber, wood products, and furniture	24,25	55	0	0	(¹)	0	9	0	0	(¹)	(¹)	(¹)	5	(¹)	(¹)	(¹)	0	0	33
Paper and allied products	26	189	0	0	(¹)	(¹)	13	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	9	(¹)	0	0	(¹)	163
Chemicals and allied products	28	1,840	30	11	29	5	927	524	16	21	7	13	29	29	25	10	8	18	118
Industrial chemicals	281-82	1,009	(¹)	(¹)	6	(¹)	561	52	(¹)	14	(¹)	11	(¹)	25	19	10	0	8	91
Drugs and medicines	283	540	0	0	9	(¹)	53	446	0	5	(¹)	(¹)	(¹)	19	(¹)	0	0	9	9
Other chemicals	284-89	291	(¹)	(¹)	13	0	213	25	(¹)	2	(¹)	(¹)	(¹)	(¹)	(¹)	0	8	0	19
Petroleum refining and extraction	29,13	472	(¹)	(¹)	(¹)	(¹)	110	3	265	3	(¹)	7	52	(¹)	(¹)	(¹)	(¹)	3	23
Rubber products	30	277	15	0	0	(¹)	34	(¹)	0	190	(¹)	(¹)	5	4	11	(¹)	5	(¹)	5
Stone, clay, and glass products	32	164	0	(¹)	(¹)	(¹)	20	0	(¹)	4	115	(¹)	(¹)	2	4	3	(¹)	2	10
Primary metals	33	268	(¹)	(¹)	(¹)	0	16	(¹)	(¹)	8	2	183	18	19	6	(¹)	(¹)	0	10
Ferrous metals and products	331-32,3391,3399	143	(¹)	0	0	0	6	(¹)	0	1	(¹)	112	7	9	1	(¹)	(¹)	0	4
Nonferrous metals and products	333-36,3392	126	(¹)	(¹)	(¹)	0	10	0	(¹)	7	(¹)	71	11	10	5	(¹)	(¹)	0	6
Fabricated metal products	34	263	(¹)	(¹)	(¹)	(¹)	19	2	2	5	2	3	175	19	8	4	3	(¹)	19
Machinery	35	2,167	2	2	2	(¹)	24	0	9	(¹)	(¹)	9	30	1,438	428	49	3	3	164
Office, computing, and accounting machines	357	1,301	0	0	(¹)	(¹)	11	0	(¹)	0	(¹)	(¹)	(¹)	842	327	(¹)	0	0	118
Electrical equipment and communication	36,48	5,104	58	555	3	(¹)	46	(¹)	(¹)	3	11	7	367	361	2,922	37	367	129	235
Radio and TV receiving equipment	365	49	0	0	0	0	0	0	0	0	0	(¹)	(¹)	0	47	0	0	0	1
Electronic components	367	355	9	(¹)	(¹)	0	1	(¹)	0	(¹)	(¹)	(¹)	(¹)	5	322	2	(¹)	13	4
Communication equipment & communication	366,48	2,903	(¹)	402	(¹)	(¹)	10	0	(¹)	(¹)	(¹)	(¹)	11	231	1,916	22	(¹)	78	179
Other electrical equipment	361-64,369	1,796	50	(¹)	(¹)	0	35	0	0	2	6	5	355	125	637	13	331	37	51
Motor vehicles and motor vehicles equipment	371	2,402	93	21	0	0	(¹)	0	(¹)	16	(¹)	3	10	176	369	1,683	(¹)	(¹)	13
Other transportation equipment	373-75,379	26	(¹)	(¹)	0	0	(¹)	0	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	2	11	(¹)	(¹)	2
Aircraft and missiles	372,19	5,034	19	1,060	(¹)	3	24	(¹)	(¹)	21	(¹)	8	45	59	504	170	2,092	(¹)	213
Professional and scientific instruments	38	888	(¹)	15	(¹)	(¹)	20	38	(¹)	2	3	(¹)	12	38	38	(¹)	7	683	19
Scientific and mechanical measuring instruments	381-82	105	(¹)	1	0	0	1	0	0	(¹)	1	(¹)	9	4	19	(¹)	(¹)	50	10
Optical, surgical, photographic, and other instruments	383-87	784	(¹)	14	(¹)	(¹)	19	38	(¹)	(¹)	2	(¹)	3	34	20	0	(¹)	633	10
Other manufacturing industries	21,27,31,39	152	0	(¹)	7	0	9	(¹)	(¹)	3	0	(¹)	6	13	10	14	(¹)	7	80
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	689	6	27	(¹)	0	15	(¹)	23	0	3	4	9	43	91	10	32	77	343

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-55.—Funds for applied research and development, by industry and secondary product field: 1974

[Dollars in millions]

Industry	SIC code	Product field and SIC code															
		Chemicals, except drugs and medicines				Primary metals		Machinery						Electrical equipment, except communication		Motor vehicles and other transportation equipment	
		Industrial inorganic and organic chemicals	Plastics, synthetic resins, rubber and fibers	Agricultural chemicals	Other chemicals	Ferrous metals and products	Nonferrous metals and products	Engines and turbines	Farm machinery and equipment	Construction, mining, and material handling machinery	Metal-working machinery and equipment	Office, computing, and accounting machines	Other machinery, except electrical	Electrical transmission and distribution equipment	Electrical industrial apparatus	Motor vehicles and equipment	Other transportation equipment
		281	282	287	284-95, 289	331-32, 3391, 3399	333-36, 3392	351	352	353	354	357	Balance of 35	361	362	371	373-75, 379
Total		435	561	134	381	159	109	406	130	277	74	1,342	262	217	280	1,879	218
Food and kindred products	20	(¹)	10	(¹)	7	0	(¹)	(¹)	(¹)	(¹)	0	(¹)	8	(¹)	(¹)	(¹)	(¹)
Textiles and apparel	22, 23	(¹)	(¹)	0	(¹)	0	(¹)	0	0	0	0	0	(¹)	0	0	(¹)	0
Lumber, wood products, and furniture	24, 25	6	(¹)	(¹)	(¹)	(¹)	(¹)	0	0	0	(¹)	0	(¹)	0	0	(¹)	(¹)
Paper and allied products	26	(¹)	9	(¹)	(¹)	(¹)	0	0	0	(¹)	(¹)	(¹)	9	0	0	(¹)	0
Chemicals and allied products	28	276	376	109	298	(¹)	12	(¹)	(¹)	8	2	(¹)	16	1	11	(¹)	(¹)
Industrial chemicals	281-82	234	347	89	117	(¹)	11	(¹)	(¹)	(¹)	2	0	(¹)	1	9	(¹)	(¹)
Drugs and medicines	283	16	6	24	15	0	(¹)	0	0	0	0	(¹)	13	0	(¹)	0	0
Other chemicals	284-89	27	23	17	166	0	(¹)	0	0	(¹)	0	0	(¹)	0	(¹)	0	0
Petroleum refining and extraction	29, 13	47	50	14	21	(¹)	1	(¹)	0	0	(¹)	(¹)	(¹)	0	(¹)	(¹)	0
Rubber products	30	15	13	(¹)	(¹)	0	(¹)	0	(¹)	0	(¹)	0	(¹)	(¹)	(¹)	(¹)	(¹)
Stone, clay, and glass products	32	8	8	(¹)	(¹)	0	(¹)	(¹)	0	(¹)	(¹)	0	(¹)	0	(¹)	(¹)	(¹)
Primary metals	33	10	(¹)	(¹)	5	138	70	6	0	(¹)	3	0	8	(¹)	(¹)	(¹)	(¹)
Ferrous metals and products	331-32, 3391, 3399	2	(¹)	0	(¹)	114	6	(¹)	0	(¹)	(¹)	0	3	(¹)	(¹)	(¹)	(¹)
Nonferrous metals and products	333-36, 3392	8	(¹)	(¹)	(¹)	23	64	(¹)	0	(¹)	(¹)	0	4	(¹)	(¹)	(¹)	(¹)
Fabricated metal products	34	(¹)	8	(¹)	8	(¹)	(¹)	0	(¹)	(¹)	9	(¹)	9	0	4	(¹)	(¹)
Machinery	35	8	8	0	12	4	8	132	89	229	38	1,025	126	(¹)	(¹)	48	10
Office, computing, and accounting machines	357	2	1	0	9	(¹)	0	(¹)	0	0	(¹)	982	0	0	(¹)	0	(¹)
Electrical equipment and communication	36, 48	25	18	(¹)	(¹)	2	(¹)	74	11	8	9	237	40	194	168	16	21
Radio and TV receiving equipment	365	0	0	0	0	0	(¹)	0	0	0	0	0	0	0	0	0	0
Electronic components	367	(¹)	(¹)	(¹)	(¹)	0	(¹)	0	0	0	(¹)	(¹)	0	45	47	(¹)	2
Communication equipment & communication	366, 48	(¹)	(¹)	0	(¹)	0	(¹)	0	7	4	6	206	(¹)	3	16	13	6
Other electrical equipment	361-64, 369	(¹)	17	0	(¹)	(¹)	(¹)	74	4	5	(¹)	(¹)	(¹)	146	105	(¹)	13
Motor vehicles and motor vehicles equipment	371	(¹)	(¹)	0	(¹)	(¹)	(¹)	131	23	23	(¹)	(¹)	(¹)	(¹)	(¹)	1,716	30
Other transportation equipment	373-75, 379	(¹)	(¹)	0	(¹)	(¹)	0	0	0	(¹)	(¹)	0	(¹)	(¹)	(¹)	(¹)	(¹)
Aircraft and missiles	372, 19	14	11	(¹)	(¹)	(¹)	(¹)	45	5	(¹)	(¹)	(¹)	30	3	45	(¹)	(¹)
Professional and scientific instruments	38	(¹)	15	(¹)	12	0	(¹)	0	0	(¹)	(¹)	37	4	(¹)	(¹)	(¹)	(¹)
Scientific and mechanical measuring instruments	381-82	(¹)	(¹)	0	0	0	(¹)	0	0	(¹)	(¹)	(¹)	2	(¹)	(¹)	(¹)	(¹)
Optical, surgical, photographic, and other instruments	383-87	(¹)	(¹)	(¹)	12	0	(¹)	0	0	(¹)	0	(¹)	3	0	(¹)	0	0
Other manufacturing industries	21, 27, 31, 39	(¹)	8	(¹)	2	0	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	11	(¹)	(¹)	1	12
Nonmanufacturing industries	07-12, 14-17, 41-47, 49-67, 739, 807, 891	7	5	2	1	1	2	17	0	(¹)	0	30	(¹)	11	3	6	4

¹ Not separately available but included in total.

Source: National Science Foundation.

Table B-56.—Funds for applied research and development, by industry and secondary product field: 1973

[Dollars in millions]

(\$Dollars in millions)

Industry	SIC code	Product field and SIC code															
		Chemicals, except drugs and medicines				Primary metals		Machinery						Electrical equipment, except communication		Motor vehicles and other transportation equipment	
		Industrial inorganic and organic chemicals	Plastics, synthetic resins, rubber and fibers	Agricultural chemicals	Other chemicals	Ferrous metals and products	Nonferrous metals and products	Engines and turbines	Farm machinery and equipment	Construction, mining, and materials handling machinery	Metal-working machinery and equipment	Office, computing, and accounting machines	Other machinery, except electrical	Electrical transmission and distribution equipment	Electrical industrial apparatus	Motor vehicles and equipment	Other transportation equipment
		281	282	287	284-86, 289	331-32, 3391 3399	333-36 3392	351	352	353	354	357	Balance of 35	361	362	371	373-75, 379
Total		383	511	114	323	142	99	353	117	260	68	1,163	265	196	252	1,815	190
Food and kindred products	20	(1)	9	(1)	6	0	(1)	(1)	(1)	(1)	0	0	8	0	(1)	0	(1)
Textiles and apparel	22, 23	(1)	(1)	0	(1)	0	(1)	0	0	0	0	0	(1)	0	0	0	0
Lumber, wood products, and furniture	24, 25	8	(1)	(1)	(1)	(1)	(1)	0	0	0	(1)	0	(1)	0	0	(1)	(1)
Paper and allied products	26	(1)	9	(1)	(1)	(1)	0	0	0	0	(1)	(1)	8	0	0	0	0
Chemicals and allied products	28	240	344	92	252	(1)	12	(1)	(1)	8	2	(1)	17	1	6	(1)	(1)
Industrial chemicals	281-82	202	318	54	86	(1)	10	(1)	(1)	(1)	2	0	14	1	5	(1)	(1)
Drugs and medicines	283	14	4	21	14	0	(1)	0	0	0	0	(1)	(1)	0	(1)	0	0
Other chemicals	284-89	24	22	17	151	0	(1)	0	0	(1)	0	0	(1)	0	(1)	0	0
Petroleum refining and extraction	29, 13	41	42	10	17	(1)	1	(1)	0	0	0	0	(1)	0	(1)	(1)	0
Rubber products	30	12	19	(1)	(1)	0	(1)	0	(1)	(1)	0	0	(1)	(1)	(1)	(1)	(1)
Stone, clay, and glass products	32	7	9	(1)	(1)	(1)	(1)	0	0	(1)	(1)	0	(1)	0	0	(1)	(1)
Primary metals	33	8	(1)	(1)	3	122	61	6	(1)	(1)	2	0	8	0	0	(1)	(1)
Ferrous metals and products	331-32, 3391, 3399	2	(1)	0	(1)	107	5	(1)	(1)	(1)	(1)	0	2	(1)	(1)	(1)	(1)
Nonferrous metals and products	333-36, 3392	6	(1)	(1)	(1)	15	56	(1)	0	(1)	(1)	0	7	(1)	(1)	(1)	(1)
Fabricated metal products	34	(1)	7	(1)	8	(1)	(1)	0	(1)	(1)	9	(1)	8	0	4	(1)	(1)
Machinery	35	7	7	0	11	3	6	117	80	210	35	879	116	(1)	(1)	47	2
Office, computing, and accounting machines	357	2	1	0	8	(1)	0	(1)	0	0	(1)	838	0	0	0	0	(1)
Electrical equipment and communication	36, 48	26	17	(1)	(1)	2	(1)	60	9	12	11	222	38	173	155	17	20
Radio and TV receiving equipment	365	0	0	0	0	0	(1)	0	0	0	0	0	0	0	0	0	0
Electronic components	367	(1)	(1)	(1)	(1)	(1)	(1)	0	0	0	(1)	(1)	0	45	48	0	2
Communication equipment & communication	366, 48	(1)	(1)	0	(1)	0	(1)	0	5	3	8	198	(1)	3	17	13	9
Other electrical equipment	361-64, 369	(1)	16	0	(1)	(1)	(1)	69	4	9	(1)	(1)	(1)	124	89	9	9
Motor vehicles and motor vehicles equipment	371	(1)	(1)	0	(1)	(1)	(1)	129	20	21	(1)	(1)	(1)	(1)	(1)	1,657	27
Other transportation equipment	373-75, 379	(1)	(1)	0	(1)	(1)	0	0	0	(1)	0	0	(1)	(1)	(1)	(1)	(1)
Aircraft and missiles	372, 19	11	10	(1)	(1)	(1)	(1)	16	5	(1)	(1)	(1)	32	5	32	(1)	(1)
Professional and scientific instruments	38	(1)	7	(1)	9	0	(1)	0	0	(1)	(1)	32	4	(1)	(1)	(1)	(1)
Scientific and mechanical measuring instruments	381-82	(1)	(1)	0	0	0	(1)	0	0	(1)	(1)	(1)	2	(1)	(1)	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	(1)	(1)	(1)	9	0	(1)	0	0	(1)	0	(1)	2	0	(1)	0	0
Other manufacturing industries	21, 27, 31, 39	(1)	7	(1)	2	0	(1)	(1)	(1)	0	(1)	(1)	9	(1)	(1)	2	12
Nonmanufacturing industries	07-12, 14-17, 41-47, 49-67, 739, 807, 891	7	6	1	2	2	2	14	0	(1)	0	21	(1)	8	3	5	5

¹ Not separately available but included in total.

Source: National Science Foundation.

APPENDIX C

Reproduction of Covering Letters, Questionnaires, and Instructions

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Form RD-1	76
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Form RD-11	79
Instructions for Survey Forms	80

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

nsf

OFFICE OF THE
DIRECTOR

Gentlemen:

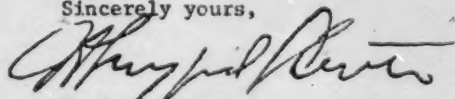
The National Science Foundation requests the cooperation of your company in completing the enclosed questionnaire for the 1974 survey of industrial research and development. These annual surveys are conducted to better understand and strengthen the overall national effort in research and development.

Data obtained in the industry survey assist Government officials in formulating policies and programs to strengthen science and technology. Individual companies have also found the aggregate data valuable in analyzing and planning their research and development programs.

The U. S. Bureau of the Census will collect and compile the survey responses for the Foundation. Inquiries regarding the survey should be directed to the U. S. Department of Commerce, Bureau of the Census, Washington, D. C. 20233.

We appreciate your past and continuing participation in this survey and will be pleased to send your company a copy of the published report upon your request.

Sincerely yours,


H. Gayford Stever
Director

Enclosures

RD-1-L1 (1-75)



UNITED STATES DEPARTMENT OF COMMERCE
Social and Economic Statistics Administration
BUREAU OF THE CENSUS
Washington, D.C. 20233

Dear Friend:

Enclosed are copies of Form RD-1, "Survey of Industrial Research and Development During 1974," an instruction manual to assist you in completing your report, and a letter from the National Science Foundation which sponsors this survey. The 1974 report on Form RD-1 should cover your entire company, unless otherwise designated.

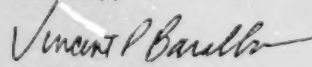
Your report to the Census Bureau is confidential by law (Title 13, United States Code, Section 9). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

With the exception of data supplied in items 2A and 2B, and in columns 2 and 4 of item 5C, the information requested on RD-1 is voluntary. The specified data in items 2A, 2B, and 5C are a basic part of the statistical program of the Bureau of the Census for manufacturing companies and would have to be reported on Census mandatory report form MA-121, if they were not provided on Form RD-1.

Compared with 1973, a new inquiry has been added to the RD-1 report form. The inquiry is concerned with research and development costs for pollution abatement and has been added to the former item 11, Energy Research and Development. Item 11 has been retitled, "Research and Development by Functional Category." In addition, certain selected companies will receive a new supplemental form, RD-3, requesting data on scientific and technical information for research and development. This supplemental inquiry will contain a section devoted to testing the feasibility of companies supplying this type of data.

We thank you for filing reports with the Bureau of the Census in the past and look forward to your continued cooperation in the RD-1 Survey. The letter from the National Science Foundation, referred to above, emphasizes the importance of the survey results. If you have any questions regarding this report, please contact Mr. Wayne McCaughey, Industry Division, Bureau of the Census, Washington, D.C., 20233, Area Code (301) 763-5616.

Sincerely,


VINCENT P. BARABBA
Director
Bureau of the Census

Enclosures



FORM RD-1 (2-74) U.S. DEPARTMENT OF COMMERCE SOCIAL AND ECONOMIC STATISTICS ADMINISTRATION BUREAU OF THE CENSUS COLLECTING AND COMPILING AGENT FOR THE NATIONAL SCIENCE FOUNDATION		NOTICE - Your report to the Census Bureau is confidential by law (Title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are exempt from legal process.	
SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1974		ITEM 1 - NAME AND ADDRESS OF COMPANY (Please correct any error in name and address including ZIP code)	
RETURN TO Bureau of the Census 1201 East Tenth Street Jeffersonville, Indiana 47130		Group Survey 4 4001	
Name of person who supplied 1973 data		PLEASE RETURN THIS COPY	
NOTE: Data supplied in items 2A and 2B and in item 3C, columns 2 and 4, for 1974 on this form, will satisfy the mandatory reporting requirement of Census form MA-121 (Title 13, U.S. Code).		CENSUS USE ONLY	
GENERAL INSTRUCTIONS			
• Please complete and return this form in the envelope provided within 30 days. Retain the file copy for your records. This report should cover your entire company, including all subsidiaries and affiliates, unless otherwise designated. • Reasonably accurate, estimate are acceptable. • Be sure 1973 and 1974 figures are comparable. • If your company reported \$1 million or more of Federal Research and Development in 1973, you also received form RD-11, requesting supplemental information for items 4, 5, and 10. Please review form RD-11 before you complete those items on this form. • Enter "None" where appropriate rather than leaving a blank space.			
PLEASE READ ENCLOSED INSTRUCTIONS BEFORE COMPLETING THIS FORM.			
Section I - GENERAL COMPANY DATA			
ITEM 2	A. Net sales and receipts of this company (Thousands of dollars)		CT1 1973 1974
	B. Total company employment in all activities during the pay period which includes the 12th of March, 1973 and 1974		2001 2002
ITEM 3	Are research and development expenditures for entire company, including subsidiaries and affiliates, reported on this form? ☐ Yes ☐ No If "No," please explain in Remarks or transmittal letter.		
Section II - RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES (Exclude R and D financed by the company but performed by others. Report such R and D in section III.)			
ITEM 4	NUMBER AND MAN-YEARS OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS (See instruction manual, page 3)		CT2 January 1974 January 1975 Man-years for 1974
	A. Federal research and development		3001
	B. Company and other research and development		3002
	C. TOTAL (Sum of A and B)		3009
For companies in which the number of research and development scientists and engineers did not change significantly during 1973 the average of columns 1 and 2 will supply an acceptable estimate for column 3. Other companies may use the average of quarterly or monthly employment figures.			
ITEM 5	COST OR RECEIPTS FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY MAJOR TYPE AND SOURCE OF FUNDS		Thousands of dollars CT2 1973 1974 TOTAL
	A. Basic research		3510
	B. Applied research and development		3521
	1. Applied research		3522
	2. Development		3529
	3. Total (Sum of lines 1 and 2)		3599
	C. TOTALS (Sum of A and B)		3599
	D. 1973 TOTALS		3600
	E. Company and other funds, except Federal, budgeted for the year 1973		3600
ITEM 6	COMPANY RESEARCH AND DEVELOPMENT ALLOWED AS INDIRECT COSTS OF FEDERAL CONTRACTS Approximately what amount of the total reported in item 5C, column 3, was allowed as indirect costs of Federal contracts? (In accordance with ASPR Regulation 15.205 and the same regulation as used in NASA and other Federal contracts)		CT1 1973 1974
	3900		3900
ITEM 7	COST OR CONTRACT VALUE OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY BY MAJOR TYPE OF EXPENSE		CT1 1973 1974
	A. Wages and salaries of research and development scientists and engineers		4010
	B. Wages and salaries of all supporting personnel (include technicians, secretaries, and other personnel)		4020
	C. Costs of materials and supplies consumed (do not include in this item components, models, and other materials supplied by other research organizations)		4030
	D. Other costs (include service and supporting costs, depreciation, and share of overhead)		4040
	E. TOTAL COSTS (Sum of A through D) (Same as item 5C, columns 1 and 2)		4099
ITEM 8	FIELDS OF BASIC RESEARCH (Of the total reported in item 5A for basic research, please give cost for the following fields)		CT1 1973 1974
	1. Chemistry		5001
	2. Engineering (including Metallurgy)		5002
	3. Geological sciences		5003
	4. Mathematics		5004
	5. Physics		5005
	6. Astronomy		5006
	7. Atmospheric sciences		5007
	8. Oceanography		5008
	9. Biological sciences		5009
	10. Clinical medical sciences		5010
	11. Other sciences		5011
	12. TOTAL BASIC RESEARCH COSTS (Same as item 5A, columns 1 and 2)		5099

Section II - RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES - Continued
(Exclude R and D financed by the company but performed by others. Report such R and D in section III.)

ITEM	APPLIED RESEARCH AND DEVELOPMENT BY PRODUCT GROUP (Of the total reported in item 5B, line 3, for applied research and development, please give cost of project for each of the following.)	CT3	Thousands of dollars			
			1973		1974	
			Federal	Total	Federal	Total
1.	Atomic energy devices (See instruction Manual, page 6)	6200				
2.	Food and kindred products	6220				
3.	Textile mill products	6281				
4.	Industrial inorganic and organic chemicals	6282				
5.	Plastics materials and synthetic resins, rubber and fiber	6283				
6.	Drugs	6287				
7.	Agricultural chemicals	6289				
8.	All other chemicals	6290				
9.	Petroleum refining and extraction	6300				
10.	Rubber and miscellaneous plastics products	6320				
11.	Stone, clay, glass, and concrete products	6331				
12.	Primary ferrous products	6339				
13.	Primary and secondary nonferrous metals	6340				
14.	Fabricated metal products	6351				
15.	Engines and turbines	6352				
16.	Farm machinery and equipment	6353				
17.	Construction, mining, and materials handling machinery	6354				
18.	Metallurgical machinery and equipment	6357				
19.	Office, computing, and accounting machines	6359				
20.	Other machinery, except electrical	6361				
21.	Electric transmission and distribution equipment	6362				
22.	Electrical industrial apparatus	6365				
23.	Radio and television receiving sets, except communication types	6366				
24.	Electronic components and accessories, communications equipment	6369				
25.	Other electrical machinery equipment and supplies	6372				
26.	Missiles	6379				
27.	Space vehicles	6380				
28.	Aircraft and parts	6399				
29.	Motor vehicles and equipment	6400				
30.	Other transportation equipment	6401				
31.	Professional and scientific instruments	6402				
32.	Ordnance, except missiles	6403				
33.	Other (Specify)	6404				
34.	TOTAL APPLIED RESEARCH AND DEVELOPMENT COSTS (Same as item 5B, line 3, columns 1, 2, and 4)	6405				

ITEM	COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY, BY STATE	CT1	Thousands of dollars			
			1973		1974	
			Federal	Total	Federal	Total
10	Were all of the research and development costs reported in item 5C, column 4, for 1974, performed in the State listed in the address block (item 1) of this form? ☐ Yes ☐ No					
	If "No," list the home State and any other States in which the various R and D laboratories or facilities are located, and estimate the costs associated with each State. If desirable, report up to 10 percent of your total as "Not distributed by State."					
	State (Attach additional sheet if necessary)					
A.		71				
B.		71				
C.		71				
D.		71				
E.		71				
F.		71				
G.		71				
H.		71				
I.		71				
J.		71				
K.		71				
L.		71				
M.		71				
N.		71				
O.		71				
P.	TOTAL COSTS (Same as item 5C, columns 7 and 4)	7199				

ITEM	RESEARCH AND DEVELOPMENT BY FUNCTIONAL CATEGORY (Of the total reported in item 5C, COSTS OR RECEIPTS FOR RESEARCH AND DEVELOPMENT, columns 2 and 4, report the following functional categories.)	CT2	Thousands of dollars				
			1973		1974		1975
			Federal funds	Total funds	Federal funds	Total funds	Total projected costs
	ENERGY RESEARCH AND DEVELOPMENT (Include the project cost or portion of project cost incurred for the purpose of increasing energy resources or capabilities. Include cost by type of energy.)						
A.	Total nuclear	8010					
1.	Fission	8011					
2.	Fusion	8012					
B.	Total fossil fuels	8020					
1.	Oil	8021					
2.	Gas	8022					
3.	Shale	8023					
4.	Coal	8024					
5.	Other fossil fuels	8025					
C.	Geothermal	8030					
D.	Solar	8040					
E.	All other energy	8050					
F.	Total of A through E	8099					
	POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT (Include the project cost or portion of the project cost incurred for the purpose of designing pollution abatement products or product characteristics or of designing pollution abatement features into processes. Include cost by form of pollution to be abated.)						
G.	Air	8110					
H.	Water	8120					
I.	Solid waste	8130					
J.	Other	8140					
K.	Total of G through J	8199					

Section III - RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS

ITEM	TOTAL COMPANY FUNDS SPENT FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED OUTSIDE THE COMPANY WITHIN THE UNITED STATES	CT1	Thousands of dollars			
			1973		1974	
			Federal	Total	Federal	Total
12		9001				

Remarks (Attach additional sheet if necessary)

Name of person to contact regarding this report: _____ Address (Number and street, city, State, ZIP code): _____ Telephone: _____
Area code Number: _____ Extension: _____

Period covered by this report: _____ From (Month/day/year): _____ To (Month/day/year): _____
Calendar year: _____ Fiscal year: _____ Specify: _____

CERTIFICATION - This report is substantially accurate and has been prepared in accordance with instructions.
Name of company: _____ Address (Number and street, city, State, ZIP code): _____

Signature of authorized official: _____ Title: _____ Date: _____

DUE DATE: 30 DAYS AFTER RECEIPT OF FORM

Form Approved: O.M.B. No. 41-R1883

FORM RD-3
(12-31-74)U.S. DEPARTMENT OF COMMERCE
SOCIAL AND ECONOMIC STATISTICS
ADMINISTRATION
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATIONSURVEY OF INDUSTRIAL RESEARCH
AND DEVELOPMENT DURING 1974
(ATTACHMENT TO FORM RD-1)NOTE: This supplementary information is
requested from you as one of the companies
with the largest research and development
programs. Complete this attachment and
return it with the COMPLETED form RD-1.RETURN TO Bureau of the Census
1201 East Tenth Street
Jeffersonville, Indiana 47130NOTICE - Your report to the Census Bureau is confidential by law (Title 13,
U.S. Code). It may be seen only by sworn Census employees and may be used
only for statistical purposes. The law also provides that copies retained in
your files are immune from legal process.ITEM 1 - Name and address of company (Please correct
any error in name and address including ZIP code)Group Survey
4 4001

PLEASE RETURN THIS COPY

CENSUS USE ONLY

INSTRUCTIONS

Included for the first time in this survey is a question
on the scientific and technical information (STI)
expenditures associated with your R&D effort. Note
that, as defined for purposes of this survey, the STI
expenditures requested have been (in previous years)
and presently should be included in the total R&D
expenditures figure submitted for your company.
Therefore, this question is not seeking additional
expenditures data, but is asking that you separately
identify your STI expenditures.We are very interested in obtaining your responses to
this question, both for 1973 and 1974, and urge you
to provide either actual dollars or reasonable esti-
mates where possible. If, however, you are unable
to answer to your satisfaction, please complete
item 14 on the feasibility of responding to the
STI question.DEFINITIONS ON THE BACK ARE PROVIDED AS
GUIDE LINES. PLEASE READ THEM CAREFULLY.

ITEM 13	Allocate your total (Company and Federal) scientific and technical information (STI) expenditures in thousand dollars to:	CT2	1973	1	1974	2
	1. Total STI manpower costs	1010	\$		\$	
	2. Externally purchased STI services	1020				
	3. Other costs	1030				
	4. Total expenditures for STI (Sum of 1, 2, and 3)	1099	\$		\$	
ITEM 14	If you are unable to complete the above question on scientific and technical information (STI), please answer the following:	Mark (X) appropriate box				
			Yes	No		
	1. Are STI data separately identified in your accounts?	1100				
	2. Are STI data available from some other source for your own use in responding?	1110				
	3. If you have answered "No" to questions 1 and 2, are there parts of the STI question for which you are able to provide data?					
	a. Total STI manpower costs	1130				
	b. Externally purchased STI services	1140				
	c. Other costs	1150				
	d. Total STI expenditures	1160				
	4. Explain fully in the remarks section below any problems you would encounter in isolating and compiling the requested STI data.					
Remarks						

DEFINITIONS

SCIENTIFIC AND TECHNICAL INFORMATION

► Scientific and Technical Information Services include Libraries and Scientific and Technical Information Centers; scientific symposia and technical meetings; scientific and technical computerized services; etc. Include all management, administrative, and operational efforts directed to the performance and improvement of the functions or tasks which deal with the processing and communication of scientific and technical information. Exclude operating costs incurred for information systems or other information services that are sold to other users outside of your company.

► Scientific and Technical Information is knowledge or data resulting from the conduct of research and development, or required for managing, organizing, administering, or performing research and development. It encompasses any information, existing in recorded or other communicable form, which describes the status, progress, or results of research and development in any area of science or technology, and which has some potential use in furthering the advancement of current and future research and development.

► STI Manpower Cost includes professional and nonprofessional personnel directly involved in STI services.

► Externally Purchased Services include costs incurred for purchase of outside sources of STI, such as Chemical Abstracts, Bio-Sciences Information Service, etc., and journals, books, fees for interlibrary loans and other outside library services, patent purchases, and other special outside services.

► Other Costs include operational costs incurred in collecting, storing and distributing your internally generated STI, and costs incurred for arranging or participating in scientific symposia and technical meetings (travel and subsistence are included). Also include in this category the administrative and overhead costs which pertain to the STI function.

Excluded are such costs as those associated with an R&D project up to and including preparation of a completed report, manuals prepared to assist staff in sales activities, legal work in connection with patent applications and litigation, and the sale or licensing of patents.

DUE DATE: 30 DAYS AFTER RECEIPT OF FORM

Form Approved: O.M.B. No. 41-R1003

Form RD-11
(11-15-74)U.S. DEPARTMENT OF COMMERCE
SOCIAL AND ECONOMIC STATISTICS
ADMINISTRATION
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATIONSURVEY OF INDUSTRIAL RESEARCH
AND DEVELOPMENT DURING 1974

ATTACHMENT TO FORM RD-1

NOTE: This supplementary information is requested from you as one of the companies with the largest research and development programs. Complete this attachment and return it with the COMPLETED form RD-1 to: Bureau of the Census, 1201 East Tenth Street, Jeffersonville, Indiana 47130.

NOTICE - Your report to the Census Bureau is confidential by law (Title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

ITEM 1 - Name and address of company (Please correct any error in name and address including ZIP code)

Group	Survey
4	4001

PLEASE RETURN THIS COPY

CENSUS USE ONLY	1	2	3	4	5	6
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INSTRUCTIONS

Breakdown of items 4 and 5 of form RD-1 - Companies reporting Federal research and development of more than \$1 million are asked to provide separate figures for the three categories of Federal agencies: Department of Defense, National Aeronautics and Space Administration, and all other Federal agencies. In general, most companies performing large amounts of research and development for the Government will have one or more separate organizational units charged with responsibility for most Federal contracts. Reporting of the requested data has been simplified for some companies by using the data available from the accounts of such units as the basis for the overall company figures on the number of scientists and engineers and the costs of Federal programs. For example, if 80 percent of the work for Federal agencies is performed by units with separate accounts, it should be reasonable to estimate the

company totals on the basis of such figures rather than make special tabulations or separate estimates for each of the company units that may be doing some work on Government research and development.

In part A below, please distribute the research and development scientist and engineer man-years (item 4A, column 3 of form RD-1) according to the share of research and development time devoted to each program.

In part B below, please distribute the costs of the research and development work (item 5C, column 2 of form RD-1) by Federal agency.

Item 10 for companies with the largest research and development programs - Companies with the largest research and development programs are being asked to report here the breakdown, by State, or Federal as well as total research and development. For such companies item 10 on form RD-1 will be left blank.

ITEMS 4 AND 5	RESEARCH AND DEVELOPMENT INFORMATION BY PRINCIPAL FEDERAL AGENCY	CT1	Man-years			
			1973	1	1974	2
A. Research and development scientist and engineer man-years (Breakdown of item 4A, column 3, of RD-1)						
1. Department of Defense		3601				
2. National Aeronautics and Space Administration		3602				
3. All other Federal Agencies		3603				
4. TOTAL FEDERAL SCIENTISTS AND ENGINEERS		3699				
B. Cost of Federal research and development during 1974 (Breakdown of item 5C, column 2, of RD-1)		CT1	Thousands of dollars			
			1973	1	1974	2
1. Department of Defense		3701	\$		\$	
2. National Aeronautics and Space Administration		3702				
3. All other Federal Agencies		3703				
4. TOTAL FEDERAL RESEARCH AND DEVELOPMENT		3799	\$		\$	

Complete form on reverse side

ITEM 10 COSTS OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY, BY STATE

Were all of the research and development costs reported in item 5C, column 4, on form RD-1 for 1974 performed in the State listed in the address block (item 1) of this form? ☐ Yes ☐ No
If "No," list the home State and any other States in which the various research and development laboratories or facilities are located, and estimate the costs associated with each State. If desirable, report up to 10 percent of your total as "Not distributed by State."

State (Attach an additional sheet if necessary)	CT1	Research and development (Thousands of dollars)							
		1973				1974			
		Federal	1	Total	2	Federal	3	Total	4
A.	71	\$		\$		\$		\$	
B.	71								
C.	71								
D.	71								
E.	71								
F.	71								
G.	71								
H.	71								
I.	71								
J.	71								
K.	71								
L.	71								
M.	71								
N.	71								
O.	71								
TOTAL COSTS		7199	\$	\$		\$		\$	
(Same as item 5C, form RD-1)									

Remarks

FORM RD-11 (11-15-74)

INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1974

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GENERAL

Information About Reporting: Additional Forms - Reporting on this form may require that companies resort to the use of estimates in answering some of the questions. We are satisfied, however, that the comparability of data among companies with research and development programs is sufficient to develop meaningful totals and measures of changes from year to year.

If you require additional copies of the form, write to the Bureau of the Census, 1201 East Tenth Street, Jeffersonville, Indiana 47130. If you have any questions regarding reporting on this form, write to the Bureau of the Census, ATTN: Industry Division, Washington, D.C. 20233.

Companies Reporting in Survey for the First Time - Companies not reporting in 1973 survey should fill in the figures for both years. If the company had no

expenditures for research and development, complete only "Item 2." Enter "No R&D" in the space for remarks on page 2 of the form, sign and return the form.

Figures for Earlier Years are Preposed on the Form If your company reported on form RD-1 for 1973, certain figures from that form have been copied to the present form. Please describe in the "Remarks" section (page 2 of the form) the reasons for any substantial increases or decreases in the 1974 figures entered on this form when compared to corresponding 1973 figures. Examples of such reasons are new government contracts, acquisitions, and disposals, revised accounting method, etc. If you acquired or disposed of a unit performing an important amount of research and development during the two-year period, please identify the unit in remarks, and give the total amount of research and development accounted for by such unit.

Revision of Earlier Year Figures - The 1973 figures should be revised if necessary to assure comparability with 1974 data. Please explain in remarks, any significant change in the 1973 figures. If your company did not report for 1973 or no entries have been entered in the 1973 column, fill in the figures for both years.

Report for Your Entire Company - Research and development activities for your entire company should be reported, including all subsidiaries and divisions of the company. If you desire to have subsidiaries report separately, please write to the Bureau of the Census and list your subsidiaries.

Period Covered by Report - The figures reported should cover the calendar year if at all possible. However, fiscal year data are acceptable for all items except employment, provided your fiscal year ends between September and March. Please report employment figures (items 2B and 4) for the period identified in each of the items mentioned.

Geographic Area Covered - The data are intended to relate to business firms in the fields of manufacturing, minerals, and other economic areas which operate one or more establishments in one or more of the 50 States or the District of Columbia.

Section I - GENERAL COMPANY DATA

Item 2 - Sales and Employment for Company - In item 2A, report the net sales and receipts of this company and its subsidiaries to customers outside the company. (Exclude domestic intra-company transfers and sales by foreign subsidiaries. Include transfers to such foreign subsidiaries, however.) The reported figures should represent value f.o.b. plant after discounts and allowances and should not include freight charges; excise taxes should be excluded. In item 2B report the number of persons employed at the company in all activities in the 50 States or the District of Columbia during the pay period which includes the 12th of March 1973 and 1974. This figure would be the same as that shown by the company in item 14 of Treasury Form 941, if the company filed one form 941 for the entire company.

DEFINITION OF RESEARCH AND DEVELOPMENT

Research and development includes basic and applied research in the sciences and in engineering, and design and development of prototypes and processes. For the purposes of this questionnaire, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.

2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.

3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate research and development organizational units of the company or carried on by company laboratories and technical groups not part of a research and development organization. We recognize that the reporting activities of such latter groups will require the use of estimates for some of the questions.

Activities to be Excluded From Research and Development - Research and development for purposes of this survey does not include quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or psychology, or other nontechnological activities or technical services.

More specifically, exclude from research and development such nontechnological activities as market research, including statistical surveys of product acceptance, estimates of market size, and studies of channels of distribution; and market development, including the sale of either old or new products to obtain acceptance of them in new outlets; economic research and other research in the social sciences; and legal work in connection with patent applications and litigation, and the sale or licensing of patents.

Also exclude from research and development such technical services as: quality and quantity control tests and analyses, trouble-shooting in connection with breakdowns in full-scale production, including related analytical work, technical plant sanitation control; work required for minor adaptations of a specific product to meet the requirements of a specific customer, including installation and servicing in a customer's plant; engineering and other technical service furnished in accordance with agreements to licensees outside the company; aid furnished by the research and development organization to manufacturing divisions to enable them to operate in accordance with previously determined formulas, standard practice instructions, or finished product specifications; aid furnished to develop advertising programs and to promote or demonstrate new products or processes, including the cost of material furnished for trial or demonstration, assistance in preparation of speeches and publications for persons not engaged in research and development, and experimental work performed at the request of the patent division to provide information needed during the prosecution of a patent litigation.

Page 2

► **Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY, IN THE UNITED STATES**

■ **Item 4 – Research and Development Scientists and Engineers** – Scientists and engineers for this survey are defined as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics equivalent at least to that acquired through completion of a four-year college course with a major in these fields, regardless of whether they held a college degree in the field.

As in the past, the figure on R&D scientists and engineers will be obtained primarily from two sources:

1. Records on the number of scientists and engineers assigned to research and development. This source is satisfactory so long as the scientists and engineers of the unit are assigned to research and development on a full-time basis (i.e., no more than 5 percent of their time is spent on nonresearch and development). For example, for company laboratories performing only research and development, report the number of scientists and engineers on the rolls in January. For other units, use source 2.

2. Figures on the proportion of total work time of scientists and engineers that is devoted to research and development. For example, if the engineering department of a manufacturing plant had 60 scientists and engineers in January 1974 and one-fourth of the scientists' and engineers' time during that month was charged to research and development projects, the figure for the number of research and development scientists and engineers included for that unit would be 15.

Estimates of Man-Years – Each of the above two methods yields an estimate of man-months (for the month of January). If the average of the two January figures is representative of the entire year, the average should be entered in item 4C, column 3, as an estimate of man-years. Otherwise, the figure in column 3 should be estimated separately on the basis of quarterly, monthly, or other time records. Total man-years of research and development scientists' and engineers' time is the same as the average number of scientists and engineers working during the year.

Separate figures are requested on the number of scientists and engineers working on Federal and company and other research and development projects. Where research and development work for the Government and for the company is performed by the same group of scientists and engineers, it will be necessary to distribute the total number of such scientists and engineers according to the program, Federal or company, for which the research and development work was performed, i.e., to use the proportion of the total work time of research and development scientists and engineers that is devoted to Federal and company research and development programs, in order to distribute the total reported in item 4C. The resulting figures should be reported

to the nearest man-year, in order to present a reasonable division of time assigned to Federal and company and other research and development programs.

Please divide the requested figures into the related cost figures and check the resulting cost figure of research and development per scientist and engineer for reasonableness.

Cost or Receipts for Research and Development Performed Within the Company by Major Type and Source of Funds – Include all costs incurred to support research and development, exclusive of capital expenditures, but including depreciation and overhead. If you perform research and development for others on contract, include the total charged for the work performed, including profit.

The relevant costs usually include but are not limited to the elements listed below:

1. Wages, salaries, and related costs. Material and supplies consumed (or purchased, if consumption figures are not available); utilities, such as telephone, telegraph, electricity, water, gas, and fuel; books and periodicals; travel and entertainment costs and professional dues.

2. Property taxes and other taxes (except income taxes) incurred on account of the research and development organization or on the facilities which the research and development organization uses. Insurance expense. Maintenance and repair, including the maintenance of buildings and grounds, depreciation on buildings, equipment, and vehicles; or rentals, if any facilities are leased.

3. Company overhead. Estimate a fair share of the cost of any functions which support research and development activities. The basis and method of estimating overhead costs will depend upon company practice. The important point is to be sure that all companies include an allowance for overhead. Items normally covered in overhead include the following:

Personnel, including personnel, medical and safety departments, and employee or industrial relations department; accounting control and fiscal (Treasurer's office); procurement and inventory, including purchasing, receiving, inspection, storage, transportation, control, and issue of materials and supplies; other services, including legal, public relations, shopwork, analytical work, plant protection, rearrangement of facilities, drafting, printing, duplicating, transportation of material and personnel, maintenance of motor vehicles, messenger service, stenographic service, and photography; salaries and related costs of research executives not on the payroll of the research and development organization.

Do not net your research and development expenditures by the amount of royalties received from either noncompany organizations or company units; or the credits received for research and development work charged or "sold" to other departments or divisions of reporting company or to outside organizations.

Page 3

Types of Expense to be Excluded From Research and Development Costs – Exclude from the cost of research and development performed within the company the cost of research and development carried on for the company by noncompany research and development organizations of any kind, or fellowships, grants, and gifts to promote research and development or the study of the sciences and engineering. That part of company-held research and development contracts subcontracted to research and development organizations outside reporting company. All work that was done for your laboratories and other technical units by noncompany organizations which are not research and development organizations (for example, model construction by a noncompany model shop) is to be considered as a purchase of equipment, material, or supplies for the company research organization rather than as subcontracted research and development.

Also exclude capital expenditures, royalties paid, patent expense, income taxes, or interest. Income from sale of products manufactured in the research and development organization if these were sold to bona fide customers.

■ **Item 5 – Research and Development Performed Within the Company by Type and by Source of Funds.**

This item provides separate columns for reporting in 1974 the costs of research and development in Federal contracts and subcontracts, and Company and Other research and development by the three types: basic, applied, and development. Definitions of "Federal," and of "Company and Other" are provided below, after the definitions of types and methods for estimating the breakdowns by type.

Types of Research – Break down the total reported in item 5 into the categories shown below:

Item 5A – Basic Research – Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific commercial objectives, although they may be in the fields of present or potential interest to the reporting company.

Item 5B1 – Applied Research – Include the cost of research projects which represent investigation directed to discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes. Note that this definition of applied research differs from the definition of basic research chiefly in terms of the objectives of the reporting company.

Item 5B2 – Development – Include the cost of projects which represent technical activity concerned with nonroutine problems which are encountered in translating research findings or other general scientific knowledge into products or processes. Do not include routine technical services to customers or other items excluded from definition of research-development above.

Methods of Estimating Research and Development Expenditures by Type – Many of the companies in this survey have accounts they believe substantially

meet the definitions used in this survey for basic research, applied research, and development. In most cases, companies have found it possible to allocate their own accounts to these categories.

If your company does not keep records that meet or can be allocated to these specific categories, there are two principal ways to reduce the task of providing the data requested.

1. Isolate the projects that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's research and development frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semi-works.

2. Isolate the organizational units whose research and development can be readily classified. If a company has two or more laboratories, the expenditures of some of these laboratories may be all classified in one or another type of research and development on the basis of the function assigned to the laboratory. There are laboratories assigned only development type work. There are others engaged only in applied or basic research. If research and development work is done in production units as well as in various laboratories, the research and development work in the production units will generally be of a development type.

The separate classification of clearly identified development operations, particularly in the industries producing expensive prototypes, will greatly reduce the balance to be distributed. The distribution will have to be estimated on the basis of a review of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development, as given above. If, despite these instructions, you feel that you are unable to distribute your research and development expenditures into groupings approximating the categories requested, please write to the Bureau of the Census describing your accounts and indicating your special problems. The Bureau may be able to make or obtain some suggestions that will be helpful in completing the report form.

Types of Activity Included in Development – The design and operation of pilot plants or semi-works plants so long as the principal purposes are to obtain experience and to compile engineering and other data to be used in evaluating hypotheses, in writing product formulas or in establishing finished product specifications, in designing special equipment and structures required by a process, and in preparing operating instructions or manuals. The engineering activity required to advance the design of a product or a process to the point where it meets specific functional and economic requirements and can be turned over to manufacturing units. The design, construction, and testing of preproduction prototypes and models and "engineering follow-through" in the early production phase is included.

Page 4

The development of designs for special manufacturing equipment and tools is included but tool making and tool tryout are not included. The preparation of reports, drawings, formulas, specifications, standard practice instructions or operating manuals, and other media for transmitting to operating units information obtained from the above activities is included. However, the production of detailed construction drawings or manufacturing blueprints is not included. The question, "When does development end and production begin?" is often asked. If the primary objective is to make further improvements on the product or process, then the work comes within the definition of research and development. If, on the other hand, the product or process is substantially "set," and the primary objective is to develop markets or to do preproduction planning, or to get the production process going smoothly, then the work is no longer research and development.

Source of Funds - A separate column in item 5 is provided for each of the following:

Item 5, Column 2 - Federal - Include the cost of work done on research and development contracts or subcontracts, and research and development portions of procurement contracts and subcontracts during the year.

Do not include here, or elsewhere in the report, research and development contracts and the portions of procurement contracts that you subcontracted to other research and development organizations. To do so would cause duplication in the statistical totals derived from these reports.

Item 5, Column 3 - Company and Other - Include the cost of all company-sponsored research and development performed within the company. (Report company-sponsored research and development performed outside the company in item 12.) Research and development is performed by a few manufacturing companies for others than the Federal Government. Such research and development should be included in this column.

In item 5E, report the expected or estimated cost of company-sponsored research and development that will be performed within the company during 1975.

Item 6 - Company Research and Development Allowed as Indirect Costs of Federal Contracts - Enter in item 6, the approximate amount of company-initiated research and development costs (included in item 5C, column 3) which was allowed as indirect costs of Federal contracts. These charges are allowed in accordance with ASPR Regulation 15.205 and the same regulation as used in NASA and other Federal contracts.

Item 7 - Cost or Contract Value of Research and Development Performed Within the Company by Major Type of Expense - The type of information requested here will be available for separate research and development organizational units or for companies with separate research and development accounts. It is not requested that special analyses be made of cost records where research and development and other functions are combined and if existing records

do not yield estimates for this item, the item need not be completed. However, if most research and development is performed in units where summaries are regularly prepared by element of cost it should be possible to base the breakdown of research and development costs upon the records of such establishments.

For wages and salaries report the gross earnings paid in calendar year 1974 to employees engaged in research and development, including dismissal pay, paid bonuses, vacation and sick-leave pay, and compensation in kind, and prior to such deductions as employees' Social Security contributions; withholding taxes, group insurance, and savings bonds. (You should follow the definition of salaries and wages that is used for calculating the withholding tax.) Include salaries of officers in the research establishment(s), if a corporation; exclude payments to proprietor or partners, if an unincorporated concern. Exclude payments to members of armed forces and pensioners carried on your active payroll. (Scientists and engineers are defined on page 3, item 4.)

For materials and supplies, report the delivered cost for all purchased materials consumed, whether received from other companies, withdrawn from inventory, or received from other establishments of this company.

Item 7C - Materials and Supplies, and Item 7D - Other Costs may be combined if a separate figure cannot be obtained or reasonably estimated from present accounts.

Item 8 - Fields of Basic Research - The following definitions are supplied for fields included in the item:

Engineering - Includes aeronautical, astronautical, chemical, civil, electrical, and mechanical engineering, and metallurgy and materials.

Geological sciences - Includes geodesy, hydrology, geochemistry, seismology, soil sciences, etc.

Atmospheric sciences - Includes aeronomy, weather modification, meteorology, etc.

Biological sciences - All sciences, other than clinical medical sciences, which deal with life processes, including plant and animal sciences, bacteriology, pathology, microbiology, pharmacology, etc.

Clinical medical sciences - All sciences concerned with the use of scientific knowledge for the identification, treatment, and cure of disease. Includes internal medicine, neurology, preventive medicine and public health, psychiatry, dentistry, pharmacy, etc.

Other sciences - To be used for multidisciplinary and interdisciplinary projects which cannot be classified within one of the above primary fields of science.

Item 9 - Applied Research and Development by Product Group - Enter both Federal and total costs of Applied Research and Development by product group. Costs should be entered in the field or product group in which the research and development project was actually carried on regardless of the classification of the field of manufacturing in which the results are to be used. For example, research on an electrical

component for a farm machine should be reported as research on electrical machinery. Also, research on refractory bricks to be used by the steel industry should be reported as research on stone, clay, glass, and concrete products rather than primary ferrous metals, whether performed in the steel industry or the stone, clay, glass, and concrete industry. Research and development work on an automotive head lamp would be classified in group 25, regardless of whether performed by an automotive or electrical company. Fields of Applied Research and Development are listed below. For those companies familiar with the Standard Industrial Classification, the 1972 SIC number or numbers are given after each title. Note, however, that the SIC definition here applies to the field of research and development effort, and not necessarily to the field in which your company's manufacturing output is classified.

Product Group

1 Atomic Energy Devices - Applied Research and Development on atomic energy devices, previously reported separately, should be included with research and development as classified in the categories listed on lines 2-33. Examples of the fields of research and development activities on atomic energy devices and the product groups in which such activities should be reported are as follows:

Activity	Product Group No.
Radioactive isotopes and other radiation sources	4
Partially fabricated reactor fuel element materials and control rods	12
Nuclear reactors	
Reactor components and equipment	
Core structurals (barrels, cans, boxes, plates, etc.)	
Heat exchangers and condensers	
valves	
Complete reactor fuel elements and control rods for use in:	14
Propulsions	
Power plants	
Other	
Atomic waste casks	
Fuel handling equipment	
Control rod drive mechanism and components for:	
Power plants	
Propulsions	
Other	20
Pressurizers, components and auxiliary equipment	
Pumps	
Accessory instrumentation for reactor control	22
Atom smashers (particle accelerators)	24
Hot laboratory equipment	
Special instrumentation	31

2 Foods and Kindred Products (SIC 20) - Foods and beverages for human consumption and certain related products, such as vegetable and animal fats and oils, prepared feeds for animals and fowls.

3 Textile Mill Products (SIC 22) - Mill preparation of fibers and mill manufacture of yarn, thread, braids, twine, and cordage, manufacture of broad and narrow woven fabric, knit fabric, carpets and rugs from yarn; dyeing and finishing fiber, yarn, and knit apparel; coating, waterproofing, or otherwise treating fabric; the integrated manufacture of knit apparel and other finished articles from yarn; the manufacture of felt goods, lace goods, bonded fiber fabrics, and miscellaneous textiles.

4 Basic Industrial Inorganic and Organic Chemicals (SIC 281 and 286) - Includes radioactive isotopes and other radiation sources.

5 Plastics Materials and Synthetic Resins, Synthetic Rubber, Synthetic and Other Manmade Fibers Except Glass (SIC 282) - Exclude glass.

6 Drugs (SIC 283) - Medicinal Chemicals, biological and botanical products, and pharmaceutical preparations.

7 Agricultural Chemicals (SIC 287) - Fertilizers, agricultural pesticides, and other agricultural chemicals.

8 All Other Chemicals (balance of SIC 28) - Explosives, soaps, glycerins, detergents and cleaning preparations, paints and varnishes, toilet preparations, and miscellaneous chemical products.

9 Petroleum Refining and Extraction, and Natural Gas (SIC 13 and 29) - Exclude geological and geophysical exploration activities.

10 Rubber and Miscellaneous Plastics Products (SIC 30) - Fabricated rubber such as industrial and mechanical rubber goods and fabricated plastics products.

11 Stone, Clay, Glass, and Concrete Products (SIC 32) - Ceramics, glass, clay products, abrasives and asbestos products, cement, stone products, concrete products, and other nonmetallic mineral products.

12 Primary Ferrous Products (SIC 331, 332, 3462, and 3399) - Products of blast furnaces, steel works, rolling and finishing mills, iron and steel castings and forgings. Includes partially fabricated reactor fuel element materials and control rods.

13 Primary and Secondary Nonferrous Metals (balance of SIC 33 and 3463) - Primary and secondary smelting and refining of nonferrous metals; rolled, drawn, and extruded nonferrous metal products, castings and forgings.

14 Fabricated Metal Products (SIC 34) - Tinware, hand tools, nonelectric heating apparatus, fabricated structural metal products, metal stampings, fabricated wire products, etc. Includes: nuclear reactors; reactor components and equipment; core structurals (barrels, cans, boxes, plates, etc.); heat exchangers and condensers; valves; complete reactor fuel elements and control rods for use in propulsions, power plants, and other systems; atomic waste casks.

15 Engines and Turbines (SIC 351) - Steam engines, steam, gas and hydraulic turbines, diesel and other internal combustion engines, n.e.c.

16 Farm and Garden Machinery and Equipment (SIC 352) - Farm machinery, including tractors for farm use.

17 Construction, Mining, and Material Handling Machinery and Equipment (SIC 353) - Construction, mining, and oil field machinery and equipment, elevators, conveyors, hoists, industrial trucks, tractors, trailers and stackers.

18 Metalworking Machinery and Equipment (SIC 354) - Machine tools, dies, machine tool accessories, rolling mill machinery, power driven hand tools, wire fabricating machinery and equipment, and automobile maintenance machinery and equipment.

19 Office, Computing, and Accounting Machines (SIC 357) - Typewriters; electronic computing equipment; calculating and accounting machines; scales and balances (except laboratory); and other computing and office machines.

20 Other Machinery, Except Electrical (balance of SIC 35) - Special industrial machinery, except metalworking, such as food products machinery, textile and paper industries machinery, general industrial machinery and equipment, and miscellaneous machinery except electrical. Includes atomic fuel handling equipment; control rod drive mechanism and components for: power plant, propulsions, pressurizers, components and auxiliary equipment; pumps.

21 Electric Transmission and Distribution Equipment (SIC 361 and 3825) - Electric measuring instruments and test equipment, power, distribution and specialty transformers, switchgear and switchboard transformers, etc.

22 Electrical Industrial Apparatus (SIC 362) - Electric motors and generators, motor starters and controls, welding apparatus, carbon and graphite brushes, electrodes, capacitors, condensers, and rectifiers. Includes accessory instrumentation for reactor control.

23 Radio and Television Receiving Sets, Except Communication Types (SIC 365) - Radio and television receiving sets, except communication types and phonograph records.

24 Electronic Components and Accessories, Communications Equipment (SIC 366-67) - Electron tubes, cathode ray tubes, resistors-capacitors, transformers and other components for electronic end products, solid state electronic devices, and telephone and telegraph apparatus. Also includes electronic guidance control subassemblies, radar and radio equipment, and electronic sighting devices. Includes atom smashers (particle accelerators).

25 Other Electrical Machinery Equipment and Supplies (balance of SIC 36) - Household appliances, electric lighting and wiring equipment, and miscellaneous electrical machinery equipment and supplies.

26 Missiles (SIC 376) - Including frames or structures, launching and handling support equipment and work on the missile system as a whole. Electronic guidance control subassemblies and radar should be included in group 24 above. Rocket motors should be included in group 28 below.

27 Space Vehicles (SIC 378) - Including frames or structures, launching and handling support equipment and work on the space vehicle as a whole.

28 Aircraft and Parts (SIC 372) - Piloted and unpiloted aircraft and parts of all types, including engines and auxiliary equipment such as landing gear, deicing equipment, turrets and turret drives, and other auxiliary equipment specifically adopted for aircraft. Radar and radio equipment and electronic sighting devices should be included in group 24 above. Aeronautical instruments should be included in group 31 below.

29 Motor Vehicles and Equipment (SIC 371) - Applied research and development related to motor vehicles, including automobiles, trucks, busses, and special purpose motor vehicles such as ambulances, fire engines, personnel carriers, amphibian motor vehicles, and truck and automobile trailers, and to motor vehicle equipment and parts (exclude batteries, tires, engine electrical equipment, etc.).

30 Other Transportation Equipment (balance of SIC 37) - Ship and boat building and repairing, railroad equipment, motorcycles, bicycles and parts, etc.

31 Measuring, Analyzing and Controlling Instruments, Photographic, Medical and Optical Goods; Watches and Clocks (SIC 38) - Engineering, laboratory, and scientific and research instruments, instruments for measuring, controlling and indicating physical characteristics. Optical instruments and lenses, surgical, medical, and dental instruments; fire control apparatus; ophthalmic goods, photographic equipment, and watches, clocks, etc. Includes hot laboratory equipment, and special instrumentation.

32 Ordnance, Except Missiles (SIC 348, 3795) - Artillery, small arms, ammunition, tanks, and parts, etc.

Item 10 - Cost of Research and Development Performed Within the Company, by State - List the States in which your research and development laboratories or facilities are located and report the cost of research and development for each State. It is not intended that information reported reflect individual assignments outside the home State of the particular research staff. As much as 10 percent of the total may, if desired, be reported as "Not distributed by State."

Item 11 - Research and Development by Functional Category.

Energy Research and Development - Include all R&D spending whose purpose is to increase energy resources or capabilities, including the development of energy equipment. Some R&D spending is for joint or multiple purposes. In these instances, estimate and report the portion of cost incurred due to the energy purpose. Energy R&D can include costs of R&D projects (both product and process) on exploration, extraction, transportation, processing, storage, generation (including conversion), distribution, conservation, etc. of present, new, or improved forms of energy. Record energy R&D spending according to type of energy. "All other energy" includes areas such as wind, waste, hydroelectric, etc. Also include in this category, (E), the development of energy equipment which cannot be readily classified in A to D. If the energy source is waste or any other area with pollution abatement aspects, consider carefully whether one of the purposes of the project is pollution abatement.

In a limited number of cases, the separation of joint (multiple) costs which is encouraged in the preceding paragraph may not be feasible. In this circumstance, include total project cost if the primary purpose of a project is energy R&D, do not include any of project cost if the primary purpose of the project is other than energy R&D.

Pollution Abatement Research and Development - Pollution abatement R&D spending for the purpose of reducing or eliminating the emission of pollutants. As used here, abatement includes prevention, treatment, or recycling; pollution refers to the emission of pollutants to the outside of a firm's (or household's) property or activities. Do not include R&D spending to contribute to environmental aesthetics, to increase equipment durability in corrosive environments, to conserve energy (include as energy R&D) and natural resources, or to increase employee comfort, safety, and health.

There can be two types of pollution abatement R&D spending. In some cases, the only purpose of the R&D spending is pollution abatement. Examples are spending on projects to improve or design alternatives to electrostatic precipitators, wet scrubber systems, waste treatment systems, effluent monitoring devices, etc. In such cases, include the total expenditures on the R&D project. In other cases, pollution abatement is one of several purposes. Examples are spending on projects to improve production processes or products and simultaneously reduce the emission of pollutants. Pollution abatement purposes could also be combined with other types of environmental control purposes such as energy conservation or employee safety and health. In all these instances, estimate and report only the portion of cost incurred due to the pollution abatement purpose.

In a limited number of cases, the separation of joint costs which is encouraged in the preceding paragraph may not be feasible. In this circumstance, do not include any of project cost unless the primary purpose of the project is pollution abatement. When the primary purpose is pollution abatement, include the total project cost in your answer.

Do not include any of project cost as being for pollution abatement if expected pollution abatement benefits are incidental. Incidental benefits are those obtained at no extra cost.

Show R&D spending according to the form of pollution being abated. For example, "air" should include such items as R&D spending on gaseous emission monitoring devices or odor pollution control; "water" should include R&D spending on water recirculation or thermal pollution abatement. R&D spending on waste compacting devices should be included under "solid waste," and R&D spending on noise and radiation pollution abatement should be included under "other."

Section III - RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE COMPANY

Item 12 - Total Company Funds Spent for Research and Development Activities Performed Outside the Company Within the United States - Report the amount of company funds spent for research and development performed outside of the company within the United States. This item includes contracts to outside organizations, but specifically excludes subcontracting of Federal Government or other company contracts.